Ontario

Royal Commission on Matters of
Health and Safety Arising from
the Use of Asbestos in Ontario

Submissions

v. 5

ROYAL COMMISSION ON ASBESTOS

INDEX OF WRITTEN SUBMISSIONS

BINDER VOLUME NUMBER: 5

Brief No.	Author	Author Category	Subject Matters	Phase I Hearing Requested	Legal Standing Requeste
040	CUPE, Local 27 and Windsor Occupational Safety and Health Council (WOSH)	Labour	I Health III Buildings V Institutional	Yes-in Windsor	WOSH: yes
041	Ms. Helen R. Hindle	Labour	I Health II Workplace VII Workmens Comp.	No	No
042	United Steelworkers of America	Labour	I Health II Workplace III Buildings V Institutional	Yes	Yes
043	Ontario Ministry of Labour	Government	I Health II Workplace III Buildings V Institutional VI Measurement	Yes	Yes
044	Canadian Centre for Occupational Health & Safety	Labour/Mgt. Organization	I Health II Workplace V Institutional	Yes	No
045	Canadian Environmental Law Association	Other Org.	V Institutional	Yes	No
046	Mr. Terry Howes	Industry	II Workplace	Yes	No

H5

40

C.U.P.E. Local 27
and
W.O.S.H.
824 Tecumseh Rd. E.,
Windsor, Ontario
N8X 2S3
519-726-5233
519-254-4192
January 31, 1981.

Dr. Stefan Dupré,
Chairman, Royal Commission on Matters of
Health and Safety Arising from the Use of
Asbestos in Ontario,
180 Dundas St. W.,
22nd Floor,
Toronto, Ontario.
M5G 1Z8

Dear Dr. Dupré,

We are pleased to submit to you eight copies of our brief, "Asbestos: Our Story---C.U.P.E. Local 27 and W.O.S.H."

We look forward to the opportunity to make an oral presentation at a public hearing. At this hearing, we will show you audio-visual material on the situation we have encountered here in Windsor. Of course, we also look forward to the opportunity at that hearing, to hear your comments on our brief and to answer any questions you may have. We request that you hold such a hearing in Windsor on an evening or on a Saturday, since it is extremely difficult for our people to get time off work to attend such a meeting during a week day.

Yours sincerely,

Gary Hardcastle

Gary Hardcastle
President, C.U.P.E. Local 27

Larry Gauthier

Larry Gauthier
Chairperson, Windsor Occupational
Safety & Health Council

TABLE OF CONTENTS

12. Letter of R. A. Dureno to Gary Hardcastle, June 18, 1980.
13. Maintenance Service Work Order, July 8, 1980.
14. Letter of Gary Hardcastle to V. Piliotis, August 19, 1980.
15. Letter of Bill Bryce to Ed Rusling, Sept. 19, 1980.
16. Letter of E. J. Laub to Bill Bryce, October 23, 1980.
17. Interview on C.B.E. Radio, October 1, 1980.
18. Letter of Gary Hardcastle to E. Laub, October 9, 1980.
19. Letter of G. Hardcastle to W. Piliotis, October 20, 1980
20. Board of Education non-compliance with Ministry of Labour guidelines.
21. Report on Asbestos Survey, October 10, 1980
22. Letter of Ministry of Education to Directors of Education, October 24, 1980.
23. Letter of Bill Bryce to Eric Laub, October 31, 1980
24. Feature on CBET, Channel 9, News, 6 p.m. November 3, 1980.
25. C.U.P.E. Local 27 Press Conference, November 4, 1980.
26. Letter of M. J. McGrail to R. H. Field, November 6, 1980.
27. Letter of R. H. Field to Mike McGrail, November 6, 1980
28. Letter of Eric Laub to Donald Milburn, November 13, 1980.
29. Asbestos Forum Leaflet.
30. Advertisement in Windsor Star, November 15, 1980
31. Summons
32. Letter of W. T. Mickle to Donald E. Milburn, November 28, 1980.
33. Press Conference, Queen's Park, December 12, 1980.
34. Asbestos Inspection Report, Gary Hardcastle
35. Letter of G. Hardcastle to L. Alexander, January 5, 1981
36. Letter of L. Alexander to G. Hardcastle, January 14, 1981
37. Minutes of Occupational Health and Safety Committee Meeting, October 22, 1980.
38. Comment on CBET, Channel 9, News 6 p.m., November 13, 1980

C.U.P.E. Local 27

The Canadian Union of Public Employees is represented in its dealings with the Windsor Board of Education by Local 27. Local 27 has been chartered since 1966; it represents 235 maintenance employees who service 54 buildings in the City of Windsor.

Local 27 is a small local union that has adopted a serious attitude towards the problems of health and safety. The sincerity with which the executive has approached these problems can be expressed in the number of hours spent on the issue. Sincerity can also be expressed in terms of finance. Our costs in working on the asbestos problem are estimated to be in the vicinity of Fifteen to Twenty thousand dollars so far.

Our membership unanimously echoed the sentiment that, if only one child or employee has been saved from a debilitating disease, the entire effort will have been justified.

Windsor Occupational Safety & Health Council (W.O.S.H.)

The Windsor Occupational Safety and Health Council is a coalition of workers, environmentalists and concerned people. We formed in the summer of 1979.

Our major emphasis is upon each worker's right to a safe and healthy workplace. We recognize the direct link between a healthy workplace and a healthy environment. Therefore, even though our main focus has been on the workplace, we are concerned about other environmental issues as well.

Our work involves us in providing support to workers who are trying to clean up their workplace. Some of the people we have worked directly with in the past are:

1) Workers in the brakeshoe operations at Bendix concerned about asbestos,

2) Miners for the Windsor Rock Salt Company concerned about carcinogens in diesel emissions,

3) Workers with isordil and estrogen in the Wyeth pharmaceuticals plant,

4) Workers in the plants in Windsor which make plastic molds, and

5) Maintenance workers, teachers, students and parents concerned about asbestos in the Windsor Public School system.

SUMMARY

In September 1979, the Director of Education of the Windsor Board of Education assured his trustees that there was no problem with asbestos in the Windsor school system. Eleven months later the Board began its survey of the schools for asbestos. This survey presented to the Board in October, 1980, was carried out by a maintenance worker who admitted that he did not know what asbestos looked like. After these facts became publicly known and after considerable public pressure, the Board finally agreed to bring in an outside inspector to reinspect all of the schools in the Windsor public school system. This survey resulted in hazardous asbestos situations being discovered in a total of thirty-three schools. Despite the fact that a priority listing was set up in mid-December for correcting asbestos problems, only two of these schools had been worked on by the end of January.

RECOMMENDATIONS

1. A programme for the complete removal of all asbestos in school buildings should be implemented.

2. Immediate corrective action should be taken in all public buildings across the province under the supervision of the Ministry of Labour with the co-operation of the Ministry of Education.

3. The Ministry of Labour should adopt as regulations the Occupational Safety and Health Standards of the United States Government. (OSHA 2206, revised, November 7, 1978) section 1910.1001.

4. Asbestos should be immediately adopted as a regulated substance.

5. The current standard for exposure to asbestos should be immediately lowered from 2 fibres per cubic centimeters of air to 0.5 fibres per cubic centimeters.

6. We, as a society, should begin immediately to find a substitute for asbestos.

7. Both secondary and elementary school teachers should be included under the Ontario Health and Safety Act, Bill 70, with full rights and privileges.

8. Adequate finances should be provided by the Provincial government to allow the local school boards the necessary support to conduct a serious removal programme.

9. A regular asbestos monitoring programme in both public and private workplaces should be required by law.

10. Regulations for disposal of asbestos should be established immediately.

11. The Provincial government should establish an independent Occupational Health & Safety Centre to conduct research and supply adequate professional support for trade union and community organizations.

PART I: THE CHRONOLOGICAL STORY OF ASBESTOS IN THE WINDSOR PUBLIC SCHOOL SYSTEM

June 28, 1979

Ontario Ministry of Education sent a letter to all Senior Business Officials in the Western Ontario Region requesting that a survey be taken to determine the extent of asbestos hazardous conditions. A response was requested by August 20, 1979. (Exhibit 1)

July 27, 1979

Ministry of Education sent a memorandum to all Directors of Education listing the major types of asbestos hazards that should be reported. (Exhibit 2) Windsor Board admitted to the Union in a meeting held on November 3, 1980 that it did not reply to these enquiries.

September 1, 1979

Robert Field, Director of Education, was asked by Ted Bounsall M.P.P. whether or not there were any asbestos problems in the Windsor school system. Mr. Bounsall was assured that there were not.

September 12, 1979

Trustee Simpson inquired what was reported by the Director, Mr. Robert Field, to the Ministry of Education with respect to articles or equipment containing asbestos in classrooms. The Director responded that "no asbestos was found." (Exhibit 3) In an in camera meeting earlier that day, the Superintendent of Plant reported that "no exposed asbestos hazards were found to exist" (Exhibit 4)

<u>January 25, 1980</u>

The Ontario Ministry of Education sent a letter to all Directors of Education reminding them of the requested survey and asking that samples be taken, followed by corrective action. (Exhibit 5). They were also asked to follow the procedures set out in the enclosed Ministry of Labour Manual entitled "Inspecting Buildings for Asbestos". (Exhibit 6)

<u>March, 1980</u>

Windsor Board of Education sent a sample from the boiler room in Hands Secondary School to the Ministry of Labour for analysis for asbestos.

<u>March 12, 1980</u>

Article appeared in the Windsor Star saying "No risk of asbestos in schools." It reported that a spokesman for the Windsor Board said "Asbestos used at any other schools has been sealed and does not pose a risk." (Exhibit 7)

<u>March 24, 1980</u>

Ministry of Labour reported that the sample contained 10% chrysotile asbestos. (Exhibit 8). The boiler room ceiling had been flaking for some time. The workers were not informed of this test, protective equipment was not issued, air monitoring was not instituted and the problem was not corrected. <u>The Union was not aware of this situation until confronting the School Administration on November 3</u>. (Exhibits 9 & 10)

<u>June 2, 1980</u>

C.U.P.E. Local 27 expressed in a letter to the Board of Education their concern regarding the possibility of asbestos problems in Windsor schools. (Exhibit 11)

June 12, 1980

OSSTF Federation President W. Bryce phoned the Maintenance Department regarding the possibility of asbestos in Windsor schools. A reply was not made to this enquiry, either verbally or in writing.

June 18, 1980

A reply to the Union enquiry was received. It stated that an investigation would be made during the summer of 1980 and that the results would be forwarded to the Union when available. (Exhibit 12)

August 8, 1980

The Administration put a C.U.P.E. Local 27 member, Don Milburn, on the job of looking for asbestos. It did not supply instructions, protective equipment, or take steps to ensure that samples were collected using the Ministry of Labour guidelines. The worker was handed the manual after he had worked on the problem for two weeks. (Exhibit 13)

August 19, 1980

The Union sent a letter to the Board saying that the Union was aware that an employee had been given the duty of inspection and sample taking in Board buildings. The Union requested that a member of the Health and Safety Committee join the investigation. A written reply was not received. The Manager of Maintenance, Mr. Ed Rusling, replied verbally that a man was on the job and that would be sufficient. (Exhibit 14)

September 19, 1980

District 1 OSSTF President, Bill Bryce, sent a letter

of enquiry to Manager of Maintenance, Mr. Ed Rusling. A reply was received one month later, October 23, from E. Laub. In this letter he stated that repairs would be completed in two and one-half months time (that is, by mid January). (Exhibits 15 & 16)

October 1, 1980

Manager of Maintenance, Eric Laub, appeared on radio. He said that the asbestos problem in Windsor schools was "of a very small nature" and was "confined to the boiler room". (Exhibit 17)

October 9, 1980

The Union became aware of an extensive asbestos problem at Ada Richards school and sent a letter of enquiry to the Board's Administration. No response was received. (Exhibit 18)

October 20, 1980

The Union sent a registered letter to the Administration repeating its concern about possible asbestos health hazards to students, teachers, as well as Local 27 members, requesting a definite commitment by October 29, 1980 on action to be taken. (Exhibit 19)

October 22, 1980

The first joint Health and Safety Committee meeting was held. The Union was told that the investigation for asbestos was complete. The Union requested that the schools be reinspected with the use of a consultant or other persons trained in the detection of asbestos since the man who did the inspection had not been trained. This request was denied.

The Administration assured the Union that any repairs would be done by mid January by the one man with an occasional helper. The Union requested that the

repairs be completed by the end of November with additional men being placed on the job to make this possible. Management reassured the Union that one man was sufficient with the occasional assistance of a helper. The Union also stated that it was disturbed by the procedures followed in inspection, sampling and repair. A detailed listing of the inadequacies was presented. (Exhibit 20)

<u>October 23, 1980</u>

The Union received a copy of the report of E. Laub, Maintenance Manager. The report listed sixteen schools where asbestos was perforated and required corrective action. This report was given to the Board's trustees the previous day. (Exhibit 21)

<u>October 24, 1980</u>

Ministry of Education sent a memo to all Directors of Education repeating the need for carefully following guidelines in asbestos work and recommending to them "The Report of the Advisory Task Force on Asbestos in Schools, May 1980" published by the Metropolitan Toronto School Board. (Exhibit 22)

<u>October 27, 1980</u>

The employee who was supposedly doing asbestos repairs had been off work for one and a half weeks. The Union became concerned that apparently no one was continuing with the repairs.

The Union received extensive material indicating that the asbestos work was faulty. Ministry guidelines had not been followed. This material included the Metro Toronto report, asbestos reports from Espanola School Board, Wellington County Board, E.P.A. material, etc.

<u>October 31, 1980</u>

OSSTF sent a letter to the Maintenance Manager, Eric Laub, again expressing their concerns. This letter went unanswered. (Exhibit 23)

<u>November 1, 1980</u>

The Union, after months of trying to gain the co-operation of the Administration, felt that it had an obligation to the students, teachers, staff and its own members to instigate a more responsible reaction on the part of the Administration.

<u>November 3, 1980</u>

Channel 9, CBET contacted C.U.P.E. Local 27 and two of its members were interviewed.

The Union met with the Administration and informed it that a press conference would be held at noon on the following day. The Union requested that administration people be part of that press conference so that the public could be assured that the asbestos problem was being corrected with the utmost expediency. The Administration listened to the four Union demands and termed them unreasonable. The Administration further assured the Union that they spoke for the Trustees and that it would be of no benefit to hold a further meeting. The Demands made were:

1. A qualified engineering consultant be hired immediately to inspect all Board premises for the possibility of asbestos contamination. This consultant should be hired with the approval of the joint Union-Management Health and Safety Committee.
2. The immediate repair of all areas where asbestos exposure is possible by a qualified asbestos repair

contractor under the supervision of qualified engineering staff.

3. Since there is no safe level of exposure to a cancer-causing agent, the union demands a program be instituted for the eventual removal of all asbestos from the Windsor Schools.
4. The Windsor School Board under the direction of the joint Union-Management Health and Safety Committee immediately undertake a program to inform the staff, teachers, students and interested parents about the dangers of asbestos, what remedies the Board plans to undertake to correct this problem, and outline specific steps that will insure that safe work practices will be devised to protect the workers and all other persons in the vicinity of these repairs.

November 3, 1980 - 6p.m.

CBET did a seven minute television report on asbestos in the Windsor Public School system. This report seriously questioned the validity of the inspection that had been carried out. This now became a public issue as all the other media picked up on the story. (Exhibit 24)

November 4, 1980

The Union held a press conference to state its cleanup demands and to express its concerns. (Exhibit 25)

November 5, 1980

Board of Education hired Dr. Ernest Sullivan of the University of Western Ontario to inspect those schools identified in the report of October 24, (Exhibit 21) as having asbestos problems.

November 6, 1980

The Union objected to the hiring of Dr. Sullivan without the knowledge of the Health & Safety Committee. The Union proposed that Dr. David Muir of McMaster University be hired and that there be a team of both Board and Union representatives to conduct a survey of the schools. (Exhibit 26)
This plan was rejected by the Administration but they agreed to allow a member of C.U.P.E. to accompany Dr. Sullivan on the inspection. (Exhibit 27)

November 12, 1980

At a meeting of the Board of Education, the Union, concerned parents and the Windsor Occupational Safety & Health Council applied pressure for an inspection of all schools. The delegations were not allowed to question Dr. Sullivan or administration members.

November 13, 1980

Mr. Donald Milburn, Local 27 member who had done the original asbestos inspection for the school board and had appeared on television where he answered questions asked of him, was sent a disciplinary letter by the Windsor Board of Education. (Exhibit 28)

November 14, 1980

The Board agreed to allow Dr. Sullivan to extend the inspection to all 60 buildings, (including the ones he had already done) and to have a union member present. The programme started on November 20, with Dr. Sullivan, G. Hardcastle, President Local 27, and A. Lawarson, Plumber Foreman.

<u>November 17, 1980</u>

C.U.P.E. Local 27. the Ontario Public Interest Research Group and the Windsor Occupational Safety and Health Council held a Public Information Meeting which was attended by around 250 people. In attendance were Dr. Gordon Atherley and the President of Local 27, G. Hardcastle, to answer questions in an open format. (Exhibits 29 & 30)

<u>November 18, 1980</u>

At a Health & Safety committee meeting, the Union suggested that the Toronto Task Force on asbestos be used as the guideline in Windsor. The Board refused to use the Toronto report, stating that people in Windsor do not live in Toronto. On December 4, the matter was again brought up and the Board insisted that the Toronto report was not law and therefore the Board was under no obligation to follow it.

<u>November 28, 1980</u>

Charges were laid against E. Laub and Windsor Board of Education under Bill 70 for not following proper safety procedures with Don Milburn. (Exhibit 31)

<u>November 28, 1980</u>

Mr. Donald Milburn was sent a letter by the Windsor Board of Education stating "it would be inappropriate for you to return to your former duties as a 'Maintenance' employee." (Exhibit 32)

<u>December 4, 1980</u>

The Chairman of the Health & Safety Committee informed the Union, in the presence of Ministry Inspector B. Lemire that the Board does not have to follow any Ministry guidelines since they are not law.

December 12, 1980

The Union held a press conference at Queens Park, Toronto. (Exhibit 33)

December 17, 1980

Inspection of schools by Dr. Sullivan, Mr. Hardcastle, and Mr. Lawarson was completed.

December 18, 1980

At a Health & Safety committee meeting in the presence of Ministry Inspector B. Lemire, Union and Management drew up a list of ten priority schools for repair. These schools were, in order of priority: Lowe, Forster, Victoria, Kennedy, Walkerville, Commerce, Prince Edward, Herman, Centennial and Campbell. Three of these schools, including the highest priority school - Lowe, had not even been on the Board's original list of schools needing corrective action. (Exhibits 47 & 48)

December 20, 1980

Union President Gary Hardcastle's "Asbestos Information Report" was completed. It identified exposed asbestos in 33 schools. Asbestos was identified in an additional 10 schools for a total of 43. The Union was advised by the Administration that it would take Dr. Sullivan three weeks to complete his report. (Exhibit 34)

January 5, 1981

The Union sent a letter to the Workmen's Compensation Board pointing out the possibility of future compensation claims. (Exhibits 35 & 36)

January 1981

Board pled "not guilty" on charges under Bill 70. Trial dates of June 29 & 30 were set.

January 22, 1981

The Board's asbestos repairs programme had reached only the second school on the priorities list set up on December 18. (Exhibit 45) The administration was again showing its lack of urgency in the matter by downplaying the need for speed. (Exhibit 46)

January 31, 1981

C.U.P.E. Local 27 and Windsor Occupational Safety and Health Council submitted brief to Royal Commission on Asbestos.

PART II: ATTITUDE OF BOARD OF EDUCATION TO ASBESTOS PROBLEM

At the outset, the Administration of the Windsor Board of Education adopted an extremely negative attitude towards Health and Safety. At the formation of the Health and Safety Committee on May 5, 1980, the Administration explained to the Union that it had checked with its lawyer and did not have to form a Health and Safety Committee due to a technicality. This technicality was that the school system did not have in excess of twenty employees at a given location. This interpretation of the law was changed thirty days later.

It was evident to Union members at the outset that the Administration did not wish to pursue the spirit of Bill 70. This was reaffirmed by the withholding from the Union of the Ministry of Labour report on asbestos in the William Hands School. (Exhibit 8)

Prior to the media attention, the attitude of the Administration towards asbestos can best be described by the Administration's own minutes. (Exhibit 37)
These minutes are well edited but do indicate the attitude.

In these Health and Safety Committee Meeting minutes of October 22, 1980, administration members made statements such as these: "asbestos is everywhere in the atmosphere", "the administration has a person working to determine if there is asbestos in the schools and when it is convenient to have two or three, it will be done" and "there is no specific problem with asbestos."

When the media attention was focused on the issue of asbestos in the schools, the administration adopted an antagonistic attitude towards concerned parents, the press and the general public as well as the Union. It was clear to even the most casual observers that the Administration was offended by the reporting of the story by the media--especially by CBET Channel 9. It is interesting to note that the Administration did not ask for any public retraction of articles

that appeared in the Windsor Star or on television. The transcript of a commentary by reporter Lee Mackenzie on CBET (Exhibit 38), however, demonstrates the pressure mounted by the Board to discredit both the media and the Union.

The Trustees blindly followed the Administration. They did not at any time allow the Union, concerned parents or members of the Windsor Occupational Safety and Health Council to respond fully to the issues. This was particularly evident at the Board meeting on November 12. The delegations at that meeting were required to make their presentation before the Administration and the inspector hired by the Board. These delegations were never allowed to ask questions of the Administration or the inspector.

On numerous occasions the Union Executive offered to meet with the Board Trustees privately; however these overtures were rejected. Unfortunately only one trustee, (Mr. H. Musson) asked relevant questions throughout the episode. Mr. Musson, Chairman of the Board until December 1980, appeared on television to say that the supervisor of Mr. Milburn would be reprimanded. To our knowledge, this has not been done.

Mr. Musson also appeared on television interviews to state that he had reviewed the TV tape and that "Mr. Milburn did not say anything wrong". The grievance over the disciplinary letter to Don Milburn (Exhibit 28) was turned down by the Trustees and is now proceeding to arbitration. Largely the Administration exerted a concerted effort to keep the Trustees uninformed.

During the episode and to this date, the Supervisory personnel have harassed the President of Local 27, Gary Hardcastle, while he is at work. Constant harassment by one or more foremen and documented cases reflect the attitude of management towards anyone who was involved in the issue of Public Health and Safety. The Union and the media were charged with irresponsibility. The facts speak for themselves.

The Trustees blind faith in their Administrative staff is shown in their acceptance of verbal assurances from Administration without receiving detailed reports. (Exhibits 3 & 4). Never did they ask about the qualifications of the person who did the asbestos survey or even how the survey was done.

Events since October have proven that this blind faith in the Administration was not deserved. The Administration has finally been forced to concede that the original survey for asbestos was not properly done and have had an entirely new survey carried out. There are indications that, for at least some of the Trustees, a rather large credibility gap is arising towards their Administrative staff.

In the later stages of the inspection by Dr. Sullivan rumours arose that the Trustees had become concerned about the cost of employing Dr. Sullivan. This has been estimated to be approximately $380 per day plus expenses for a total cost in the vicinity of $13,000.00. The Union had offered to conduct the asbestos inspections entirely at Union expense; this offer was repeatedly refused.

At this point possible asbestos hazards remain in the schools. We are still awaiting the report from Dr. Sullivan. The Board has still not repaired the ten priority schools agreed to at the joint Administration-Union meeting on December 18, 1980. The Trustees and Administration of the Windsor Board of Education continue to act as though exposed asbestos is not a real danger.

PART III: THE MILBURN CASE

One of the most disturbing aspects of this affair has been the attitude of the School Administration and Board towards the health of the maintenance workers. In his report to the Board on the situation with asbestos in the schools in October 1980 (Exhibit 21), Eric Laub, Maintenance manager, reflected this careless attitude when he assured the trustees that there was no need to worry about the situation since 85% of the exposed asbestos was confined to boiler rooms. What about the health of the maintenance workers who have to go into those boiler rooms?

The way in which the person who was assigned to undertake asbestos inspection sampling and repairs was treated by the school board's administration is another example of blatant disregard for the health of the workers.

Don Milburn, a maintenance employee of the Windsor Board of Education with twenty-seven years of service, was the employee given the task of inspecting and taking samples for asbestos. Don Milburn was told to do inspections for asbestos without it being stressed that asbestos was potentially dangerous to his health.

On Monday November 3, 1980, Mr. Milburn appeared on television and answered questions posed by a reporter regarding his knowledge of asbestos. (Exhibit 24). As a result of this interview, Mr. Milburn received a disciplinary letter. This letter is the subject of a forthcoming arbitration case. (Exhibit 28)

On November 28, Mr. Milburn received a letter from Personnel Manager W. Mickle stating that "We are of the opinion that it would be inappropriate for you to return to your former duties as a 'Maintenance' employee". This letter also is the subject of a Union grievance. (Exhibit 32)

It seems clear from these two letters that the school administration is harassing this employee because of the public embarrassment that he has caused them by factually answering questions posed to him by a reporter.

It is the contention of the Union that proper procedures were not followed pertaining to Mr. Milburn's health and safety. As a result, court charges have been laid under Bill 70. (Exhibit 31). Court dates have been set for June 29 and 30, 1981.

PART IV: COMMUNITY REACTION

On November 3rd, 1980 CBET-TV broadcast the first report about asbestos in the schools. Donald Milburn, a maintenance worker, told how he inspected schools without either proper instructions or protective equipment.

This news stunned our community. Were the children of Windsor exposed to this deadly carcinogen? Could the Board of Education really have been negligent in protecting the students and staff?

These questions required a long pause. This was the second time in less than a year that the danger of asbestos had hit the headlines of our local media. In the early part of January 1980, the community had been told about a young father of two, who had contracted inoperable lung-cancer after working at the Bendix Corporation for only 11 years.

This information jolted a city that has grown hard through generations of factory work. People expect life to be difficult. Assembly line work is dull and even sometimes deadly. So you learn to get used to the worst! But lung-cancer to this young Tommy Dunn was a powerful reminder of the unknown dangers lurking behind these factory walls.

It is important to note, as well, that another event helped to establish 'asbestos' in Windsor. This was the closure of the two Bendix plants in the midst of a health and safety dispute. No community in this country is more traumatized by plant closures than Windsor, and, therefore, this had a very chilling effect on our citizens.

The contradiction between health and work was enacted, in the case of Bendix, in full view of our whole community. This choice which in reality occurs daily in the lives of many workers dramatized the dilemma. How much is your health and safety really worth?

So when C.U.P.E. 27 became involved with asbestos, the citizens of Windsor already were educated to its dangers and

consequences. This will become evident as the different roles of community organizations are described.

LABOUR MOVEMENT

The response from the labour movement was the most emphatic of any community organization. Because of their daily experience they were aware of the danger that asbestos held for their members. The Windsor and District Labour Council endorsed the actions taken by Local 27. They co-sponsored the public forum with Dr. Gordon Atherley from the Centre for Occupational Health and Safety. They gave money themselves and are presently sending letters to all their affiliates asking for money to help defray C.U.P.E. 27 court and legal expenses, which they will incur for charging the Board of Education for violations under Bill 70 (Exhibit 39).

Another case of labour support came from the high school and elementary school teacher's unions. The Ontario Secondary School Teacher's Federation (OSSTF) and the Men and Women's Public School Federations both attended C.U.P.E. press conferences as participants. They also stated publically on numerous other occasions their concern about possible asbestos exposure and the need to have a second inspection other than Dr. Sullivan's.

Accompanying this strong support from the local labour movement was the consistent encouragement from both the Provincial and National C.U.P.E. offices. The National President of C.U.P.E., Grace Hartman, wrote a letter giving the full weight of the largest union in the country to securing a complete inspection of the Windsor schools. (Exhibit 40)

Colin Lambert, the Industrial Hygienist for C.U.P.E., also came to Windsor and accompanied for one day Gary Hardcastle and Ernest Sullivan on their tour of the schools. He provided some important advice concerning proper protective equipment to be worn while inspecting for asbestos.

Finally, on the evening of the public forum with Dr. Atherley, C.U.P.E. sent Bozica Costigliola to report for their national publications on the efforts of C.U.P.E. 27.

On the Provincial level, Mr. Jack Bird, C.U.P.E. staff person for the Ontario School Boards, joined representatives from C.U.P.E. 27 and W.O.S.H. at a press conference held at Queen's Park.

Having mentioned C.U.P.E., the different teacher's federations, and the Windsor Labour Council, it is important to mention the other worker's organization which provided the most reliable and consistent assistance to C.U.P.E. 27 -- the W.O.S.H. Council.

It was while attending a health and safety course, organized by W.O.S.H. instructors at St. Clair College, that possible solutions to the problem of asbestos in the schools began to be discussed. In the absence of any local medical or scientific support, W.O.S.H. provided an invaluable service offered by no other Windsor agency, by donating their resource centre, time and energy into this important cause.

W.O.S.H. was particularly well versed on the subject of asbestos due to their very active involvement around this same problem at the Bendix Corporation with U.A.W. Local 195. Their experience helped in developing an approach which drew on the high-level of community support which finally forced the Windsor board to conduct an asbestos inspection in all 54 schools.

COMMUNITY ORGANIZATIONS

The most important support outside the labour movement came from three different sources. First, the immediate reaction of parents and students at different schools put immense pressure on the board to negotiate with the union. Secondly, the intervention of Dr. Gordon Atherley and his Centre provided the union with not only increased credibility, but also with their only professional medical support. Finally, the role played by the local news media (particularly CBET-TV) maintained constant public information and pressure on the Board.

We will examine more closely the role played by each of these groups.

Parents & Students

The day after the story broke there were immediately numerous telephone enquiries to the Windsor board by concerned

parents. They wanted to know what action was being planned to correct or isolate this hazard. Even more dramatic was the action taken by such parents as Pam Etches, Margaret Longmoore and Sue Kelly who withdrew their children from the Begley school after discovering exposed asbestos insulation in the school gym. (Windsor Star Nov. 6, 13, 18).

The concern of these three women was so strong that they began to develop an organization for parents to pressure the Board for a full inspection. They also assisted C.U.P.E. by distributing over 5000 leaflets door-to-door announcing the public forum in the vicinity of the schools which were listed as having exposed asbestos.

The most dramatic example of student reaction was the 'walk-out' at William Hands School (Windsor Star Nov. 6). This was the same school where the Board had taken a sample of loose insulation in March, 1980. A month later they had received a confirmation from the Ministry of Labour that, indeed, it was asbestos. (Exhibit 8). It should be emphasized that from the time the Board knew that there was possible asbestos exposure in the boiler room at Hands (April, 1980) until November 3rd, 1980 when the union was informed, the Board never repaired it, never informed either the union or the workers in the boiler room, nor did they in any way demonstrate any concern for the health of the staff or students by changing work practices and isolating the area.

When the students walked out at Wm. Hands, it was based on the very real and well founded premise that the Board of Education had consistently acted in an irresponsible manner in failing to protect their health against possible asbestos exposure.

This irresponsible attitude of the Board, which often took the form of blaming the victim, was transmitted by even the Hands Administration to concerned parents. The following story is an instance of this.

On November 10th, voting for municipal offices occured. Two members from W.O.S.H. voted at the Dougall School. After voting, out of curiosity, they began to examine the area within the

vicinity of the polling booth for asbestos, and discovered exposed asbestos within a few feet of where the public was voting!

They notified a woman working there. After examining the area herself, she told about how her children had been involved in the walk-out at Hands. She said that a Hands' vice-principal had called her and suggested she order her two children to return to school and stop creating bad publicity for the school.

This woman told the vice-principal that after what had happened at Bendix she would not endanger her children's health and that until such time as the school board corrected the problem she would support her children's action!

These responses should indicate how sections of the community felt. There existed within many strata of the population a deep frustration with the way the Board continually failed to correct this problem. These parents and students were expressing their anger which was quite appropriate under the circumstances.

Dr. Gordon Atherley and O.P.I.R.G.

At a certain moment the question of asbestos danger in the schools seemed to revolve around whose opinion you most believed: either Dr. Sullivan who claimed there was no problem or C.U.P.E. maintenance people who believed there was. This is an enactment of a debate which occurs quite frequently in the occupational health struggles. 'Experts' vs 'Workers' are counterposed to each other. Who do you believe?

In the midst of this dilemma, C.U.P.E. 27 contacted Dr. Atherley and requested his help. His willingness to come to Windsor and speak at the public forum was a decisive factor in the Board hiring Dr. Sullivan to conduct a complete inspection of the schools.

The Ontario Public Interest Research Group (O.P.I.R.G.) was another community organization that provided important assistance to C.U.P.E. through a publication on asbestos that they wrote (tech. data) as well as through their provincial office which secured the guidelines and recommendations used by the Toronto School Board.

The provincial NDP researcher, Mr. Terry Moore, also proved to be an important source of support. He organized a meeting between a delegation from C.U.P.E. 27 and W.O.S.H. with members of the NDP Provincial Caucus. This discussion helped to broaden the issues and cast further light on how the Ministry of Education and Labour were complicit with the negligence of the Windsor Board.

Media

We believe that the Windsor media, in general, played a decisive role in helping to alert the community about the danger. While the Windsor Star, CBE, CJOM and CKWW all carried extensive coverage, CBET-TV, in our opinion, provided the most important public service in reporting this story. This is particularly so because of CBET's resistance to the pressure mounted against it by those who were unhappy with the story.

Such figures as Wm. McRae, the director for the Windsor Separate Board, told the CBE radio and the Windsor Star that CBET was employing "scare tactics" and "irresponsible journalism". These sentiments were echoed by other trustees as well. (Windsor Star Nov. 12, Dec. 11.)

These attacks against the media, which were orchestrated by the trustees and administration staff, reflected their attitudes and strategy in dealing with the problem of asbestos. Instead of correcting the problem and removing any possible danger, they tried to shift blame and distract the public from what was the central concern. CBET journalists, however, consistently forced them to respond to the real issues of public health and safety.

Conclusion

All the organizations mentioned played an important role in contributing to the first step in eliminating this very real danger. They have succeeded in getting a complete inspection of the schools for asbestos. They will be a force pushing for the continuation of this process until the health of the public is secured.

PART V: THE PROVINCIAL GOVERNMENT'S IMPACT

The ramifications of the situation in Windsor go well beyond the Windsor Public School system. What we have seen raises two questions of a province-wide concern.

1) What part did the provincial government play in correcting this potentially hazardous situation? and

2) Is it possible or, indeed, likely that a similar situation exists in other school systems in this province?

The Question of Responsibility:

When asked in the legislature on December 11, 1980, by Michael Cassidy what action the Ministry of Education was going to take in the situation with asbestos in the Windsor schools, Bette Stephenson, the Minister of Education, responded:

> I would remind the honourable member that the responsibility for the provision of facilities for education at the local level is that of the Board of Education, duly elected by the local people. We have done a great deal to assist, encourage and persuade boards to carry out their responsibilities for the investigation of potential asbestos problems. Some of the boards have been a little slow to respond and we have tried to encourage them to speed it up. We have done that. I believe we are now almost at the completion of that activity.

The Minister of Education is saying here that the role of the provincial government in this matter is only "to assist, encourage and persuade", not to take responsibility for making sure that the matter is actually dealt with.

This is one of the recurring problems in provincial-municipal relations: the avoidance of assumption of responsibility. The provincial government escapes from assuming

responsibility for the matter by saying that we don't want to take the power for the operation of the school system from "the board of education, duly elected by the local people." So, under the guise of local autonomy, an always popular position to take, the province is able to squeeze out of a potentially embarrassing situation.

The question that must be raised in these debates over the respective responsibilities of the local and provincial authorities is "is the matter of such central importance or of such seriousness that there must be a uniform minimum standard of performance or service provided regardless of which local jurisdiction the person happens to be living in?" It is undebatable that asbestos is potentially very dangerous to the health of students, teachers and other workers. A matter which can in the long run result in the deaths of countless people must most certainly be seen as of such seriousness that the province must assure that it is dealt with promptly and completely. The correction of such a health hazard cannot be left up to the varied reactions of different school boards.

It is useful to contrast the reaction of the Metropolitan Toronto School Board with that of the Windsor Board of Education. The Metropolitan Toronto School Board set up a task force which developed a very detailed document presenting stringent guidelines for the cleanup of the schools in the metro Toronto area. The guidelines in this document were much stricter than the guidelines sent out to all school boards by the Ministry of Education. The Windsor Board of Education, by contrast, did not consider asbestos to be such a serious matter that they had to follow even the weaker guidelines of the Ministry of Education. This, we are sure, is just one example of the differing degrees of seriousness with which the local school boards have approached the matter throughout this province.

Is it legitimate to allow the protection provided to people's health to vary from one school jurisdiction to another?

The provincial government should not just "encourage, assist and persuade" school boards to protect the public from asbestos hazards. It should require the school boards to provide this protection promptly and completely.

Financial Responsibility:

One of the arguments against requiring a school board to take particular action is that this results in the board having to allocate funds to that programme. This may upset the priorities of the local school board. This can affect school boards that are relatively poor in a rather serious way.

As part of the province's programme of "assisting, encouraging and persuading" boards to deal with the asbestos problem, the province has told the boards that there is provision for financial support. The problem with this provision is that it has not been a precise commitment. The province has not said that it will pay a certain proportion of or all of the costs in cleaning up the problem. This has left the boards of education feeling that they cannot rely upon this financial assistance. School boards, therefore, are scared off from approaching the asbestos problem in a highly committed way because of their fears of the financial implications that may arise.

To assure that the problem is dealt with thoroughly in all jurisdictions throughout the province, the provincial government must assume full responsibility for the costs involved.

Ministry of Education Request for Reports:

In June 1979, The Ministry of Education sent a letter to each school board requesting a survey of all schools to determine if "any hazardous conditions exist due to asbestos." (Exhibit 1). The results of the survey were to be in by the end of August, 1979.

In January 1980, the Ministry sent out another letter

requesting that samples be taken of any suspicious materials. (Exhibit 5). At this time they also sent out a document prepared for the Ministry of Education by the Ministry of Labour called "Inspecting Buildings for Asbestos." (Exhibit 6). This means that six months after the original request for a survey and four months after the survey was supposed to have been completed, the Ministry of Education finally gave the school boards instructions on how to conduct the survey.

In May 1980, the Ministry of Education tabled a report in the provincial legislature stating the response that had been made by each school board by the beginning of April 1980. (Exhibit 41). At that time thirty-seven out of a total of 184 boards in the province had not made a report. This means that one out of every five boards had not responded to the Ministry's request. These thirty-seven boards that did not report accounted for a total of 1562 schools. This is seven months after the reports were all supposed to have been submitted.

There was considerable variation between the regions in the response rate. In two regions -- midnorthern and northwestern-- all school boards had reported by this time. At the opposite extreme is the Western region taking in the area from the Bruce Peninsula to Essex County. Here twelve out of twenty-four boards had not submitted complete reports by April 1980. This variation indicates a breakdown within the Ministry itself. Clearly each of the regional offices of the Ministry of Education did not approach the question of asbestos inspection with equal degrees of seriousness.

The other question that arises is how thorough the reports that were submitted actually were. In the April report, in only 367 of the 3[illegible]65 schools reported on was it stated that there was asbestos. Only five of the schools were reported to have asbestos in the plenum chambers. Our experience with the Windsor school system makes us seriously question the accuracy of these reports. Similar methods of school construction have been used throughout the province. Therefore, one must expect that the situation with asbestos use in the schools is relatively equal from one area to the other.

Just how detailed were the reports that the Ministry of Education received? We have only one example available to us, but if it is any indication there is not much reason for feeling reassured. The Windsor Roman Catholic Separate School Board submitted a report to the Ministry simply stating that "this Board does not have asbestos hazards in its schools". The Regional Director of Education acknowledged receipt of this report without question as to how the survey was done. (Exhibits 42 & 43).

The Windsor Board of Education also gave such assurances to the public until forced into doing a new survey in which many situations were discovered that had been missed in the first survey. Indeed, the school that then became the highest priority as having the most hazardous situation had not even been mentioned as a problem in the original survey.

How many people in this province are attending or working in schools that they have been assured are safe only because a proper survey for asbestos has not been conducted?

The Guidelines:

On January 25, 1980, the Ministry of Education sent to each school board in the province a document entitled "Inspecting Buildings for Asbestos". (Exhibit 6) This manual prepared by the Ministry of Labour was supposed to provide the guidelines that each school board would follow in dealing with asbestos problems. There were two major problems with these guidelines: 1) they were not strict enough and 2) they were guidelines only, not requirements.

1) Lack of strictness: We will not discuss here the limitations of these guidelines in any detail. It is important, however, to point out the fundamental flaw which this document has at the inspection stage. On page 3.1 it states: "A survey of buildings should be carried out initially by maintenance staff, in order to locate areas where asbestos is contained in building materials." It says nothing about training these people in recognition of asbestos, nor does it suggest bringing in experts

to identify asbestos. This means that the first essential stage of finding possible asbestos hazards is likely to be improperly done. In contrast with this Ministry of Labour guideline on inspection is the recommendation of the Metropolitan Toronto School Board Advisory Task Force on Asbestos in Schools: "Visual inspection involves primarily a walk-through of the entire building by trained personnel." The Advisory Task Force also calls for a comprehensive physical inspection. "Physical inspection involves checking those areas that are hidden from view and could require touching or disturbing asbestos-containing material." The Ministry of Labour never mentions such an inspection. This is only one example of the lack of strictness in the Ministry of Labour's guidelines.

Clearly, even the Ministry of Education now realizes that the Ministry of Labour's guidelines are inadequate. Fourteen months after the original request for a survey, the Ministry sent a letter to each director of education drawing their attention to three documents: 1) The Report of the Advisory Task Force on Asbestos in Schools (the Metropolitan Toronto School Board Report), 2) Inspecting Buildings for Asbestos (Ministry of Labour) and 3) Asbestos-containing Materials in School Buildings, A Guidance Document (U.S. Environmental Protection Agency). (Exhibit 22)

2) Guidelines only, not requirements: The Windsor Board of Education did not even follow the minimal Ministry of Labour guidelines that had been sent to it by the Ministry of Education. Exhibit 20 lists some of the guidelines that were not followed. When questioned as to why they were not following the guidelines, the Windsor Board always replied that they did not have to follow the guidelines since they were not law. On a matter as serious as asbestos, it is not sufficient to have guidelines looked upon as mere suggestions. The Ministry of Education should have been clear as to what its requirements for action were.

Ministry of Labour Inspectors:

Ministry of Labour inspectors became directly involved in

October 1980 in the Windsor schools asbestos problem. The role they played was one of evaluation and recommendations. They apparently had no intention of issuing directives. They publicly announced in the Windsor Star their obligation to serve their client -- the Windsor Board of Education. (Windsor Star Nov. 6, 1980)

"The two labour ministry officials said they could not release their findings to the Star. Jurij Bilyk, senior media relations officer with the ministry, said the ministry acted as a consultant to the board and could not release information gathered while performing a service for a client".

When it was suggested to the officials by the Union that directives should be issued particularly where there was removal of asbestos, their reply was negative.

The few recommendations made by the Ministry of Labour inspectors were not enforced. For example, a recommendation regarding barriers in front of boiler room doors for all the schools was not taken seriously by the Board. When the ministry official became aware that no barrier had been constructed, after a time lapse in excess of two weeks, he simply asked when it would be constructed. The Board contested the recommendation at first, but eventually produced a simple plastic barrier.

In this case the union feels a firm approach should have been taken particularly when the Board showed total disregard. This constant leniency on the part of the Ministry of Labour inspectors forced the Union to take stronger action in order to achieve an adequate response from both the Board and the Ministry.

The Board of Education became very unhappy when Ministry of Labour inspectors entered a school without first informing the Board of Education. This resulted in a critical letter being sent to the C.U.P.E. 27 President (Exhibit 44) and in his being written up for being 15 minutes late for work. This was the first time he had been late in ten years.

Attitude of the Provincial Government:

From everything that has been said in this discussion of the provincial government's role in dealing with the asbestos problem

in the school system, it is clear that the province did not approach it with the seriousness that it deserved. The statement of Bette Stephenson, Minister of Education, in the provincial legislature on December 12, 1980 sums up the government's attitude:

> I do hope the leader of the third party (NDP) is very much aware that he has been living with natural asbestos as a result of the structure of the earth on which he lives for all of his life.

PART VI: CONCLUSIONS AND RECOMMENDATIONS

As a result of the experience gained by the Canadian Union of Public Employees, Local 27 and the Windsor Occupational, Safety and Health Council in combating asbestos exposure in the Windsor Public School System, we wish to make the following recommendations for consideration by the Royal Commission on Asbestos:

1. Since there is no safe level of exposure to a cancer-causing agent and since we have the responsibility for protecting the health of future generations, a program for the complete removal of all asbestos in school buildings should be implemented.

2. Since complete removal will take a period of time, we recommend, as a temporary measure, that immediate corrective action should be taken in all public buildings across the province under the supervision of the Ministry of Labour with the co-operation of the Ministry of Education. This is a very important recommendation since our experience has indicated that no one agency seems to have the clear authority to enforce and protect the public from possible asbestos exposure.

3. When taking corrective action which would include the removal, encapsulation and enclosure of asbestos, the Ministry of Labour should adopt as regulations the Occupational Safety and Health Standards of the United States Government. (OSHA 2206, revised, November 7, 1978) section 1910.1001.

4. Asbestos should be immediately adopted as a regulated substance. This will ensure that the confusion around the difference between 'guidelines' and 'regulations' will be eliminated.

5. The current standard for exposure to asbestos should be immediately lowered from 2 fibres per cubic centimeters of air to 0.5 fibres per cubic centimeters. We recognize that there is no safe level of exposure to a carcinogen, so the 0.5 standard should be viewed as a minimal level.

6. We, as a society, should begin immediately to find a substitute for asbestos. This should be done with the co-operation of the federal government.

7. Both secondary and elementary school teachers should be included under the Ontario Health and Safety Act, Bill 70, with full rights and privileges. Without the action of C.U.P.E. 27, the other staff would have had no real power to protect their health and lives.

8. Adequate finances should be provided by the Provincial government to allow the local school boards the necessary support to conduct a serious removal programme. It was clear from the Windsor experience that no real money was being given to assist the local board and, therefore, contributed to their irresponsible attitudes and practices.

9. A regular asbestos monitoring programme in both public and private workplaces should be required by law.

10. Regulations for disposal of asbestos should be established immediately. Windsor city workers (C.U.P.E. Local 82) were exposed to asbestos fibres while dumping refuse at a city landfill site.

11. The Provincial government should establish an independent Occupational Health & Safety Centre to conduct research and supply adequate professional support for trade union and community organizations.

41

7 Chatterton Blvd.
Scarborough, Ontario
M1M 2G3

February 5, 1981 261-6917

J. Stefan Dupre, Ph.D.
Chairman
Royal Commission on Asbestos in Ontario
180 Dundas Street West
Toronto, Ontario

Dear Sir:

Being the widow of a former Canadian Johns-Manville employee, I feel I must write and tell you of my plight. I am sending five copies, one to each person on the Royal Commission Board.

My husband, Wm. J. Barton, passed away August 24, 1978 from many causes one of which was asbestosis. He also developed Lupus Erithmetosis. He started work at the Port Union plant in 1950 and by 1964 was suffering from unknown causes. By 1967 he developed serious lung problems and was told he had a spot on his lung. By the end of 1967 he was admitted to hospital and by some miracle survived. Over the years to 1977 he became steadily worse and was retired from the Manville plant with a Manville Pension of $143.00 and a Workmen's Compensation Pension of $423.50 per month because of a 50% disability caused by the work hazards at the Manville Plant, and a $188.00 monthly disability Pension.

When he passed away, my Manville Pension was cut off completely and my claim was rejected by the Workmen's Compensation Board. Mr. Neilson appealed for me, and we asked for an extension on that date. Mr. Neilson worked on Mrs. Dodds claim, and was to handle mine immediately afterwards. In the meantime, Ken Montgomery has been named Union President. I contacted Mr. Montgomery and was told he would pull out my file and contact the company lawyer and get back to me, which he never did. I called again this week and was told the Workmen's Compensation Board have done nothing on the file to this date and Mr. Montgomery has no idea when they will. Perhaps they are waiting for the Royal Commission Report.

This is unbelievable, a man receiving $143 monthly company pension; $188 monthly disability pension and $423.50 Compensation from the Board and at his death his wife receives nothing save $143.89 Canada Pension. TheCompensation Board has admitted that his 50% disability that helped to cause his death was from the asbestos dust.

These widows are going through hell trying to survive in such inflationary times. My income amounts to $158.14 monthly, the new C.P. figure, plus $186.73 monthly DVA Pension for widows plus whatever I can earn, which must not exceed $2100 annually or my pension will be reduced accordingly. At 60 years of age and with back problems, this isn't easy.

I am not at the point where I feel I must sell my home to survive. I do not wish to sell my home and I feel the Workmen's Compensation Board and Canadian Johns-Manville are responsible for my situation. What can be done about it I don't know, but I intend to keep trying to find out. Perhaps the Royal Commission on Asbestos Use will come up with some answers.

Yours truly,

Helen R. Hindle
(I reverted back to my former name)

[illegible]
[illegible], Ontario
Feb. 3, 1981

361 [illegible]

Linda Kahn M.D.,
Executive Coordinator
Royal Comm on Asbestos,
180 Dundas St. W. Toronto

Dear Madam-

Being the widow of a former Canadian Johns Manville employee, I feel I must write and tell you of my plight. I am sending six copies, one to each person on the Royal Commission Board.

My husband Wm. J. Barton passed away Aug 2nd, 1979 from causes, one of which was Asbestosis. He had also developed Lupus Erythematosis. He started work at the Port Union Plant in 1950 and by 1964 was suffering from unknown causes. By 1967 he developed serious lung problems and was told he had a spot on his lung. By the end of 1967 he was admitted to hospital and by some miracle survived [illegible].

[illegible] to 1977 Mr. Barton's condition worsened considerably and he retired from the Manville Plant with a pension of $143.00 monthly, a Government Disability Pension of $[illegible] monthly, plus a Workmen's Compensation Board Pension of $423.50 per month given to him for a 50% disability received by the work hazards at the Johns Manville Plant.

When Bill passed away, the Manville pension expired too and the Disability Pension [illegible] Compensation Board payment. My claim for a widow's pension was rejected by the Board. Mr. Paulson appealed on my behalf and later asked for an extension which was granted. Mr. Paulson worked on [illegible]

[illegible] to handle mine immediately. [illegible] was [illegible]
In the meantime [illegible] Montgomery has been [illegible]
[illegible] President. I contacted Ken at 282-1052 and was
told he would pull out my file through the Company
lawyer, contact the Compensation Board, and get back to
me, which he never did. I called again this week
and was told [illegible]
[illegible] my claim and he [illegible] no [illegible]
commitment from them and has no idea when they will
move on my claim & he has no answer for me. [illegible]
the Board is waiting for the Royal Commission Report on [illegible]

This is unbelievable. A man receives a total of
754.00 per month and at his death the widow [illegible]
nothing except a Canada Pension of $143.[illegible] monthly. The Compensation
Board has already admitted that [illegible] 50% disability
that he had. Cause his death was from the [illegible]
[illegible] dust.

The widows [illegible] claims have not been settled
are going through hell trying to survive in such [illegible]
times. My [illegible] amounts to $158.[illegible] monthly [illegible]
[illegible] plus $186.13 monthly Old Age Pension [illegible] plus
[illegible] which must not exceed [illegible]
[illegible] a [illegible]
with back problems, this isn't easy.

I am now at the point where I feel I must sell my
home to survive. I do not wish to sell my home and I feel
the Workmen's Compensation Board and Canadian [illegible] are
responsible for my situation. What can be done about it
I don't know, but I intend to keep trying to find out.
Perhaps the Royal Commission or [illegible] will come
up with some answers.

Yours truly,
[illegible] McN[illegible]

I reverted back to my former name

42

PRESENTATION TO THE

ROYAL COMMISSION ON MATTERS OF HEALTH

AND SAFETY ARISING FROM THE USE

OF ASBESTOS IN ONTARIO

Prepared by:
Health & Safety Department,
National Office,
United Steelworkers of America.

February, 1981.

OVERVIEW OF EFFECTS OF EXPOSURE TO ASBESTOS.

Generally, the dangers of exposure to asbestos are well known. The data shows clearly that it causes asbestosis, bronchogenic carcinoma, mesothelioma and possibly cancer of other parts of the body. Up to now, no "safe" level of exposure has been established. While it is true that the same can be said for most carcinogens, the ability of asbestos to cause cancer and other diseases in various parts of the body -- unlike most other carcinogens -- means that the lowest possible exposure levels should be the objective at all times. While it is generally accepted that Crocidolite and Amosite pose the greater hazard to workers and society in general, the fact of the matter is that none of the various types of asbestos in use (including Chrysotile) can be given a clean bill of health by any rational person or persons at this point in time.

Asbestosis was the first clearly shown manifestation of asbestos in man. It is an insidiously slow but progressive deterioration of the lung's ability to cope with the body's needs with respect to different gases. At present, there is no indication the resulting disease process can be reversed once it is detectable. The usual clinical changes which accompany the development of asbestosis are clubbing of the fingers, shortness of breath and other physiological symptoms associated with pulmonary insufficiency.

LUNG CANCER

The first documented epidemiological evidence of the cause and effect relationship of asbestos and lung cancer was reported in 1947 by Dr.E.R.A. Merewether in the United Kingdom.

He reported cases of lung cancer in a group of 235 persons who were known to have died of asbestosis. This represented an incidence of 13.2% and was ten times higher than the incidence of lung cancer amongst persons known to have silicosis at about the same time.

Since that time, work by Doll and Selikoff has proven the link between asbestos and lung cancer. Lately, Selikoff's work has shown the importance of cigarette smoking. His data shows that the incidence of lung cancer amongst cigarette smoking asbestos workers was 92 times greater than amongst those who neither smoke nor work with asbestos (or other carcinogens).

MESOTHELIOMA

Asbestos was first seriously suspected as being the causative agent in 1960 with the reported findings of 33 cases of pleural mesothelioma in South Africa in an asbestos mining area. All but two of the victims were shown to be probably exposed to asbestos twenty or more years earlier. This relationship has since then been supported by other studies.

GENERAL

While the importance of cigarette smoking cannot be overemphasized in the development of lung cancer amongst asbestos workers, it must be equally strongly emphasized that cigarette smoking does not have the same synergistic effect when it comes to asbestosis, mesothelioma or other physiological effects other than lung cancer.

NO SAFE LEVEL

As stated earlier in this presentation, no one has been able to show there is a "safe" level of exposure to asbestos below which there is no risk of an increase in the incidence of asbestos related diseases. It is true that the Hygiene Standards Committee (H.S.C.) of the British Occupational Hygiene Society (B.O.H.S.) concluded, from a study done in England, that

for an accumulated dose of 100 fibre years per cubic centimeter it is probable that the risk of being affected by asbestosis to the extent of having clinically observable signs is less than 1%. But this standard does not pretend to measure the risks of an increase in the incidence of cancer and mesothelioma among asbestos workers.

Since no known "safe" level of asbestos exposure is known at this time, and since asbestosis and other asbestos related diseases are irreversible -- but avoidable -- prudence dictates that exposure should be reduced to an irreducible minimum.

In the case of manufacturing of asbestos products in Ontario, the case for minimum exposure is stronger still. The fact of the matter is that a large part of the asbestos products manufactured in Ontario is for export to other provinces or countries. Unfortunately, any adverse health effects experienced during the manufacturing process are not exported. The workers become, and remain, the unwilling recipients of these unwelcome attendant after effects. In effect, the workers subsidize the cost of the product by sacrificing part of their health and their lives.

In our view, the consumer must pay the full cost of the product and the cost of providing a healthy work environment for workers in the industry which makes these products.

OVERVIEW OF OUR EXPERIENCES

The history of organized labour is not only a history of struggle for fair wages. It is also a struggle for decent working conditions. Progress has been very slow as it has been a long and bitter struggle against those employers and governments which have placed economic consideration above people in their scale of values and priorities. With very few exceptions, concern for human well-being and life has been placed second to the press for production, productivity and the economic well-being of "society".

It is not the enhanced morality of the large corporations that has helped to alleviate the situation. Rather, it has been the long, difficult struggle on the part of workers and their organizations. In the course of this struggle, countless numbers of nameless workers have been ravaged by occupationally induced cancer, killed or crippled for life and then discarded and abandoned (along with their families) after they could no longer work.

Unfortunately, the evolution of health and safety legislation and enforcement has been slow and uncertain. And again, it has been the result of struggle rather than benevolence. Fortunately, we are now in a position where we can make significant advances, but there are still a few stumbling blocks in the way of progres. We must be aware of these problems and expose them to the harsh glare of reality so we can overcome them in the pursuit of our legitimate objectives.

1) Government agencies whose function is to regulate, administer and enforce public health and safety laws regarding workplace hazards, environmental and otherwise, are often caught between

thc principle of protecting the worker's health and disrupting the economic order; a precarious balancing act between these conflicting pressures. The result is too often delay and sometimes the subversion of the technical judgments of the scientists (within and outside of government) by political considerations. The principle long adopted by independent scientists of opting for minimizing risk rather than maximizing economic benefits is only now beginning to be recognized by government, while some corporations and their tame technical servants still choose benefits over risks and attempt to pass on costs, legitimately their responsibility, to society at large.

2) The development of modern technology has bestowed on us a mixed blessing. On the one hand, we have benefited from labour saving devices, new cures for sicknesses and improved transportation. On the other hand, we have increasingly uncovered, among the new products and processes, a new generation of pollutants and health hazards for the worker. The new occupational health problems relate much more to the invisible causes of industrial death and suffering, such as asbestos, heavy metals, chemicals and even more exotic ones such as ionizing radiation found in the uranium mining and processing industries.

3) Industry's and government's first response was to try to assure us there really was no health hazard caused by exposure to the various chemicals and toxic substances. In many cases, tame scientists who were prepared to sell themselves for a fast buck were hired to show that a certain substance or process was not proven unsafe.

In most cases, the weight of evidence against the disabling and death-dealing substances was assembled a long time ago. In the case of asbestos, there was a pretty clear indictment against it as a killer since about 1930. In the case of radiation in uranium mines, the evidence was pretty clear around the turn of the century that it was a killer. In the case of coal tar, it was shown, over two hundred years ago, that it caused cancer. The case against some heavy metals goes back even further.

It is obvious that industry and government knew, or should have known, workers were being exposed to deadly substances in the workplace. For them to have denied knowlege of any harmful effects attached to these substances must mean they were guilty of ignorance or deceit of the worst kind.

In any event, it was finally admitted by government and industry that there is an increased risk of death or disability because of exposure to certain substances. But industry then immediately started to use a new phrase to block our repeated demands for a healthy and safe workplace. No doubt you are familiar with the phrase -- it's called "acceptable risk" and I predict this phrase is going to be one of the biggest stumbling blocks in the way of progress in the field of prevention.

ACCEPTABLE RISK

Our policy with respect to "acceptable risk" standards of exposure to known toxic substances is that there has been too much double talk about this concept, especially as it may apply to carcinogens, which can kill a person just as surely as a knife, a bullet or hanging.

The thinking of those who promote the "acceptable risk" idea is that everyone accepts some risk whenever they undertake to drive a car, smoke a cigarette, fly in a plane, etc.

They go on to rationalize that we accept the risks because of the benefits we derive from the act of driving, smoking or flying. In the same way, they would have us believe there is a level of risk on the job which is acceptable to society because of the benefits of the job to society.

But there are certain things that are conveniently not mentioned, and this was clearly highlighted in a report by the Science Council of Canada when they had this to say:

> "It seems that those at greatest health risk are often not those who derive major benefits. Since this is a characteristic of our socio-economic system it is often neglected by those engaged in risk/benefit analyses. As well, it is obvious that risks and benefits cannot be measured with the same currency".

All this is a nice way of saying workers pay the costs by loss of health or life and industry derives the benefits in the way of monetary benefits. The bottom line to this thinking is that workers should place their lives at risk in order to enable industry to get greater profit.

Let's examine this issue from a different perspective:

Obviously, we are being asked by society -- whoever that may be -- to accept a certain level of excess occupational disease and death of workers for the greater good of society. But it is this same society that, in Canada, has decreed that convicted murderers should not be subjected to the death penalty.

Two of the many arguments put forward for the abolition of the death penalty for murder are as follows:

1) the convicted murderer may have been innocent, and to condemn him to death is irretrievably wrong; and

2) to condemn a person to death is barbaric and morally wrong.

"IS IT LESS ONEROUS OR BARBARIC TO CONDEMN INNOCENT WORKERS TO DEATH THAN IT IS TO CONDEMN CONVICTED MURDERERS TO DEATH?"

Surely, in natural justice, workers are entitled to as much consideration as are murderers in Canada.

Labour and workers totally reject the concept of an "acceptable risk" level of exposure to known cancer-producing or death-dealing substances, simply because it is still the workers who are asked to pay the risk -- <u>with their lives</u>. Our position is that the segment of society which derives the major benefit

from any undertaking must be the one to pay the costs of eliminating the risks in that undertaking.

The right to life must not be relegated below the right to greater profit.

COST/BENEFIT ANALYSIS

Much of society's thinking with respect to cost/benefit analysis has been moulded by the constant barrage of advertising and commercialism. We have been led to believe that the important progress is the progress in the changed technical methods of production and communications, better machinery and equipment and a wider variety of consumer products available for our use. This may have been true at one time, but it can't be true any longer. This kind of thinking has had an adverse effect on the engineers' values against traditional social or humanist values. Industrialism, and all that it stands for, has emerged as a form of dogma, or creed.

It now seems that industry and administrators have forgotten that all institutions, including industry, were made to serve society, not society to serve institutions. Government generally supports industry in this notion of man and machine and these dogmas are now leading us to physical and moral disaster.

It is the unthinking adoption of this dogma which permits anyone to seriously propose the "acceptable risk" concept with a clear conscience. The greater pity, of course, is that they see nothing wrong in engaging in risk assessment exercises and cost/benefit analyses in which one side of the equation is measured in terms of human lives. The other side of the equation is usually measured in dollars and cents.

Let's take a look at the realities of the situation:

In most cases, industry can bring about a zero exposure to carcinogen conditions in the workplace by introducing the best technology available. Also, in most cases, the costs would not bankrupt industry; it would merely reduce the level of profit. The costs of cleaning up surely could be amortized over a period of years so that profits would not be eliminated for one or two years, but merely reduced over ten or twenty years. Can anyone seriously suggest it is a greater hardship for shareholders to give up part of their profits than it is for workers to give up their lives?

In the same way, I cannot accept that the cost of cleaning up must be passed on to every Canadian and create a further unfavourable impact on the rate of inflation. Providing a clean workplace must be a legitimate part of the cost of doing business in Canada and it must be paid for out of the proceeds of sales. Industry has enjoyed the benefits of big profits because they have neglected to pay this part of their costs until now.

If anything, cleaning up the workplace should provide a boom in the economy of a country. Let's look at it seriously and realistically.

Industry's profits in 1979 were over $30 billion and the projected profits for 1980 are $36.908 billion. This is a total of about $70 billion. If all industry spent an average of two years' profits in cleaning up, this would inject sorely needed money into the economy. This is money that normally would not have found its way into the economy in the way of creating new industries and jobs. Make no mistake about it -- money spent on cleaning up the workplace doesn't just disappear into some void or vacuum. It does create a demand for new equipment, services and jobs.

Take the example of Cassiar Asbestos Corporation in the province of British Columbia. It is an open pit asbestos mining and milling operation in an isolated northern community. The concentrations of asbestos fibres was intolerably high in the mining and milling operations as well as in the community itself. We brought things to a head in the fall of 1975, and within a year's time the company had finalized plans to completely revamp their entire operation so that the concentrations of fibres would be brought well below the existing standards. They were to have spent about $50 million in the process of cleaning up. Very little (if any) of that money was spent outside of North America. It was spent to purchase and install new equipment -- and the company did not have to raise its prices because of this expenditure. Indeed, being a relatively small operation they would soon have found themselves at a competitive disadvantage if they would have unilaterally raised their price for asbestos fibre.

Considering that Cassiar employs just under 600 employees, their cleanup act contributed significantly to our economy in a positive way. Not only did they create new work now, but they probably reduced the amount of money that will have to be spent on health care in this community in the future. So, far from having had an adverse effect on our economy, it has had a decidedly beneficial impact; and certainly it did not feed the inflationary spiral.

RUNAWAY INDUSTRIES

I know that, despite all my moralizing, there are those industries who still opt for higher profits, even if it does mean the premature death of some people in the work force and the community. I know they will threaten to relocate their industry elsewhere if forced to clean up their act. Very frankly, in many instances, we have found their threats to be pure bluff.

I also know that, in some instances, industry will actually relocate somewhere else. Some place where they do not have to be as concerned about the welfare of their workers and the community. From a moral point of view, is this the type of industry we want to be dependent upon? From a very practical point of view, I think there is only one solution to such a problem and it must be applied swiftly and openly.

If any industry does fold up and move elsewhere because of health requirements they may have to meet here, government must be prepared to levy a sufficiently high import duty, on any goods manufactured by the runaway industry, to ensure that the runaway industry will not enjoy a competitive advantage over those industries which are prepared to be good corporate citizens.

OUR CONCERNS

"PREVENTIVE" RATHER THAN "CURATIVE" POLICIES

From a general point of view, let us first suggest that our general experience has led us firmly to the point of view that in order to deal with the hazards that confront workers in all the varying environments to be found within industry, a basic philosophy that all activities to improve various situations should be aimed at "prevention" rather than at "cures".

Not that there are not many areas and many individuals now who are not in need of "cures" of one kind or another as a result of exposure to industrial environments and processes. But it is our experience that all too often we have been wise "after the fact" .... at incalculable cost to the individual. We firmly believe that activities should be marked by efforts to "prevent" rathern than to "react" to consequences of hazardous and hostile work environments, processes and practices. This is especially important in the case of asbestos since there are no cures for asbestos related disease -- only prevention or death!

It is not our intent here to dwell at great length upon some of the past results of "re-active" rather than "preventive" policies in the entire fields of industrial hygiene, safety and health. These are too well known to bear great repetition here.

But to buttress our basic contention, we submit that "preventive" policies in these areas of safety, health and hygiene could well have averted many of the tragic consequences we now know of in many instances.

We point to the now widely exposed problems of inhalation of asbestos fibres with its "time-bomb" effects of a heightened incidence of asbestosis, lung cancer and mesothelioma. While it is correct to say that "general" knowledge of the consequences of these hazardous dust fibres is "generally" new, an examination of the literature on the effects of asbestos fibres on living tissue

shows it <u>not</u> to be very new. We contend that had this knowledge been acted upon in the past, we may have averted some of the tragic consequences we have now encountered.

The same thought would apply to effects of inhaling radon gas in the uranium mines of this country and, in particular, in those mines where a clearly recognizable hazard, in the form of excessively high silica content in the host rock and ores, obviously escalated the dangers of pulmonary impairment. It is worth recalling that precise warnings of the possibilities of "irretrievable tragedy" were given to the government of Ontario, the mine managements and the public as early as 1958.

We can point to the tragic consequences of the building and operation of a nickel sintering plant in Coppercliff, Ontario in 1948, when there was information available that a similar sintering plant in Clydach, Wales had produced an increase in the incidence of lung cancer and pulmonary impairment among the workers there, and had been closed.

Or we could point to the effects of new and less well known chemicals and substances that have health-impairing or death-dealing properties. Vinyl chloride comes quickly to mind, but there are many others.

In general, we think we have made our point and we submit as firmly as we can that the introduction of foreign, metallic or chemical substances to living tissue is a matter for the most acute and rigorous scientific examination before living beings are subjected to the effects of exposure.

We believe that past experience is valid and of great importance when such studies are made. It is from past experience that a great deal of scientific data and knowledge as to the probable results of exposure of human tissue to this or that foreign material is already within our grasp and knowledge and data has been put to work to avert "insult to living tissue" or that sufficient effort has been made to fully correlate and make available such knowledge and data.

MEDICAL AND WORK PROFILES AND LINKAGES

With regard to existing practices of keeping records of health or disabilities as they apply to individual work persons we are strongly of the opinion that much more is required. The problems of protecting workers currently at work for greater or lesser periods of time presents a particular and difficult problem. Quite frequently, diagnosis of ailments that might properly be described as work related, or work environment related, go undetected or unreported. Given exposure to a particular substance and then the development of one or another form of disease, we believe that all factors should be considered in diagnosis as to cause, but we are not satisfied that this happens.

We are not satisfied that, in many cases, sufficient weight is given to the effects of exposure to one or another contaminant or lethal substance.

For example, we now know that very short exposure to asbestos dusts and fibres can have the most serious effects upon the individual's health, but the symptoms and illness may not occur for many years. During this period the individual involved may have moved away from and even forgotten about a brief exposure to the fibres and dust. There is nothing in the records that in any way could show a cause and effect relationship. Such impairment may well be diagnosed incorrectly or inadequately because vital information simply is not available to the medical practitioner. In addition, any compensation or other rights possessed by such an individual will be lost as well.

It is this kind of experience, which we believe to be all too common as workers move from job to job or area to area, that we contend will be overcome by the most careful, detailed and comprehensive medical examinations at the beginning of employment maintained on a regular basis, and the maintenance of work and medical profiles for all workers. We know of no other way in which the desired results could be attained.

As an example, we cite the cases of many men who suffered from exposure to nickel sinter dust and possible carcogenic effects between the years 1948 and 1963 in the nickel sintering plant at Coppercliff, Ontario. For more than five years, since the hazards have become apparent in 1970, the union has been searching out these men to ascertain the state of their health and should there be pulmonary impairment, either in the form of lung cancer or otherwise, seeking to establish claims either for the man involved or his dependants. We are happy to report that in a number of instances the union has been instrumental in establishing compensation claims and benefits for widowed women or for incapacitated workers.

But this is surely a most primitive procedure, arising from apparent unconcern about the possible effects of industrially induced disease. We point out that had there been, during the life of that plant, careful medical and work records and profiles kept, together with forwarding addresses for the workers involved, remedial actions through the Workmen's Compensation Board of Ontario would not have been forfeited nor delayed and withheld for extended periods of time as they have been under the existing situation.

CONFIDENTIALITY OF RECORDS

Before I address myself to the question of confidentiality, I wish to outline the areas of record keeping about which we have concerns.

The position of the United Steelworkers of America, with respect to exposure records and medical records, is that there must be a complete work history of every industrial worker which, coupled with a complete medical profile, will enable us to quickly identify and eliminate potentially hazardous working conditions. In addition, more specific information as to the cause of death should be given on a death certificate so death due to occupational diseases can be more easily identified.

The need for the establishment and the maintenance of such medical and work profiles for all new workers coming into the work force is quite apparent. The adoption of this principle for older established workers simply means that we must "begin somewhere" and that any delay in establishing these practices at this time will only compound the problem.

Only in this way can the present untenable situation, where the burden of proof of exposure and impairment rests upon the victim, be changed to the point where all industrially-induced diseases and impairments will be properly recognized and society's obligations to such unfortunate people be acknowledged and discharged without delay.

Obviously, different people have different ideas of what a medical profile and work record should consist of. Accordingly, I submit the following proposals for your consideration and discussion:

1) There must be a complete pre-employment medical examination for all persons entering industry. Such examination should include a detailed analysis of the operating levels of all bodily functions and organs; for example, there should be a complete check of eyesight, hearing, lung function, reactions and all of those things that are used as a yardstick to determine a person's physical and mental well-being.

2) There must also be medical surveillance programs instituted in all industries. Periodic medical re-examinations should be conducted on a routine basis with the frequency of examinations and the more specific areas of medical concern to be dictated by the type of industry the person is in and also by conditions encountered by individuals in their work environment(s). In this way a very comprehensive medical record, or profile, can be built up for each employee over a period of time.

3) A comprehensive work record should be kept on behalf of every worker in industry. On a general basis the work record must indicate, to the extent possible, the specific area in which an employee has worked or is working.
On a more specific basis, the work record must contain the most exact and up-to-date information possible about the various contaminants encountered by the individual on an on-going basis in any assigned workplace. It is very important that the levels of concentrations of the various

contaminants also be accurately determined and recorded in the individual's work record.

Both these requirements must be rigidly adhered to as total exposure to any substance can be accurately determined only when concentration levels and duration times are accurately determined and recorded.

4) I suggest it is also important that death certificates should contain more information than just the immediate cause of death and relevant peripheral information should be added to the medical profile of the individual. For example, if a person were killed in a car accident and it was also known that the person had lung cancer, that particular piece of information may be important to an epidemiologist at some later date.

5) It is imperative that the medical profiles be kept in some central government agency and access to this information should be available only to a) the individual or his designated representative, or b) a researcher or group of researchers, in which case the identity of the person is not made known to the researchers.

6) It is equally important that the work records also be kept in some central agency and the individual must have the right to examine his work record at any reasonable time. In connection with this it may be well to point out that the individual must also have the right to periodically monitor or audit the input to his work records in order to determine the accuracy of such input.

7) I think it goes without saying there must be strong linkages between the agencies in charge of medical records and work records.

The next thing I wish to discuss is the question of what could be accomplished by keeping accurate health and work profiles such as

I suggest. In the first place, let it be clearly understood that it will <u>not</u> prevent occupational diseases. I do not for a moment suggest that we set up a system of record-keeping instead of taking the proper preventive action in various occupations. These record-keeping procedures must be viewed in a different context.

In the first place, a comprehensive medical surveillance program will make it possible to determine any deterioration of a person's physical well-being at the earliest moment possible. Obviously, if a cure is possible for any particular disability, the earlier the disability is detected, the easier it will be to effect a cure. If there is no cure for any particular disability, and it is shown by an analysis of medical and work records that the disability may be job-related or aggravated by continued exposure to contaminants or toxic substances found in the workplace, effects of the disability can be minimized by removing the person from further exposure to harmful substances.

In the second place, any medical practitioner can obviously more accurately diagnose the type and cause of any illness or disability if there is available a pool of knowledge such as in the medical and work records or profiles.

In the third place, extensive record-keeping and the constant linking of information in these records can help determine, in the future, the adequacy, or the inadequacy, of today's preventive measures. In this sense it will help future workers in society.

Finally, the data accumulated in these proposed record systems will allow epidemiologists to provide us with more precise qualitative data with respect to the effects of various toxic substances and carcinogens. For example, we know that exposure to asbestos causes an increase in the incidence of cancer, but we don't know how many additional cancers are caused by a given amount of asbestos. The system we propose can provide us with the means of getting more precise information.

I personally find it repugnant to have to follow such a route, but unfortunately too many government bureaucracies will accept nothing short of this type of proof before adopting more stringent preventive measures.

As to the question of confidentiality, it is obvious that different segments of society may have different views on the subject -- often for reasons unrelated to a positive concern about health problems. The United Steelworkers of America is of the view that in the interests of promoting high quality epidemiologic research, scientists must have access to records containing accurate, personal, individually identifiable information.

It is time that accurate bulk data from group medical records and group exposure records should provide the information necessary to allow accurate conclusions to be drawn. It is also time that adequate linkages can be established on a group basis without the names of the individuals concerned being made known to the researchers. But in the final analysis someone does have access to the information on a personal basis. Generally, we are not concerned about the use of personal information in health research, but rather the possible misuse of such information by private companies or individuals, or public agencies, in making decisions which may adversely affect the individual. It is to this extent that we are concerned about invasion of personal privacy in the question of confidentiality.

We are satisfied that research can be made easier, more accurate and less expensive without endangering personal privacy rights so long as safeguards are in place to prevent misuse or unauthorized redisclosure of the information. Accordingly, we are in favour of medical record privacy legislation that will protect patient confidentiality, but will permit the use of medical information on the records for important epidemiological research, provided appropriate safeguards are in place.

The United Steelworkers of America is also strongly in favour of providing access to the records to employees and their representatives. We favour such a policy because access to information is the cornerstone to building an effective program to prevent and, if necessary, control exposure to hazardous substances in the workplace. The present system of one-sided access by employers to medical information has handicapped the development of progressive safety and health programs.

These confidentiality concerns of ours are mainly in connection with medical records. Our position with respect to records of exposure is that such record should, in most cases, be made as widely known as is possible. The exposure records should be accurately compiled and the levels of concentrations of various contaminants should be posted in appropriate workplaces. Individuals should be notified of their personal exposure and a record of their exposure regularly and meticulously recorded in the central files for storage and retrieval.

As an aside, I might point out that the scientific community has not been generally seen to be very insistent or vocal on the question of accurate records of exposure. In the interests of less expensive and more accurate results, one would think that access to accurate exposure data is as important as access to accurate medical information. Personally, I would have thought that, collectively, researchers and epidemiologists would have joined in the demand for exposure records and all that that entails.

In summary then, the United Steelworkers of America favours access to medical records and the assurance of confidentiality as outlined. We also favour the widespread dissemination of information about exposure to the workforce, the individual and his representative and to central agencies. We have a keen interest in these matters because it is our members who are being disabled or killed and, as Rachel Carson said,

"The obligation to endure gives us the right to know."

SELF-REGULATION AND SAFETY COMMITTEES

Traditionally, most government safety and health regulatory agencies have relied very heavily on the self-regulation process in the work place. Stated in the simplest and bluntest form, in many cases health and safety regulations were only platitudes expressed in complex legal language, and it was expected that industry would voluntarily comply with the intent of the regulation. In those instances where the regulations could be enforced it was usually done on a discretionary or judgmental basis and only rarely would they be enforced by court action.

The concept of self-regulation has some obvious attractive virtues, but its main defect has been its dismal failure to produce any significant improvements in safety and health matters in the work place, except in those cases where the employer voluntarily accepted his moral responsibility to provide a cleaner and safer work place.

The self-regulation model has not, and does not impress those who place profit before life and limb in their order of priorities.

The introduction of regulations, making it mandatory for certain operations to have joint safety and health committees, is a step in the right direction in the effort to make self-regulation work, but the process will not, and cannot succeed until all such joint committees are given the power to do an effective job.

At present, what can committees do? If the workers are insistent and support their committees through the collective bargaining process, or if the employer is sincerely interested in improving matters, the statutory powers of committees won't be a limiting factor. It is true that most statutes decscribe what committees ought to do, but in most cases these duties amount to holding meetings, keeping records and/or making recommendations. Some provisions do give real power, but the point I want to stress is that most present-day legislation

should serve as a starting point, and not an end point, if committees are to make a real impact on health and safety.

A committee's performance depends on several factors, such as attitudes, resources and authority. I won't say much about attitudes, except that they come from within and are controlled by the individual. But given the best attitudes, what happens to a health program recommended by a safety committee if management is not willing to implement it? How about an education or training program that management refuses to fund? Or a document not produced because it may reveal a "trade secret". These sorts of problems are part of the every-day life of committees and, for the most part, the regulations leave committees on their own to work them out.

The obvious difficulty is that, given a stalemate, nothing happens; and to that extent the unco-operative party with power always wins. One of the important factors in assessing the committee's effectiveness is the absence or presence of a method of resolving disputes.

Manitoba has issued a Code of Practice which committees are asked to use and it does contain suggestions on dispute resolution with respect to complaints received. Bill 17 in Quebec has taken some bold steps in dispute resolution. It is really the only piece of legislation which provides in a serious way for the third party involvement as a requirement of law. Many people may object to such a procedure, but it will probably be a giant step in getting both management and labour to take committee responsibilities and powers very, very seriously.

In closing, I submit that any regulatory structure which does not provide for these suggested requirements makes a mockery of the concept of self-regulation and will remain a sham unless all employers voluntarily abandon the traditional master and servant relationship in the work place.

PUBLIC RESPONSIBILITY

Traditionally, our union has brought problems of safety, health and industrial hygiene to the bargaining table. We have done so because, in the absence of other fully effective channels to overcome the problems we confront, collective bargaining was seen to be one way in which we could seek correction of hazardous situations.

However, for those of you familiar with the practices of collective bargaining, you will readily understand that under the give-and-take of that method frequently central and important safety, health and industrial hygiene problems have been "bargained off the table". While we do not surrender the collective bargaining approach entirely, we are strongly of the opinion that what is required is a shifting of these concerns from the processes of collective bargaining to the arena of an enlightened legislative body, responsible and responsive to the requirement of safeguarding the lives and health of industrial workers and the well-being of society generally. We do not believe that the health and safety of employees should be bargained against their economic needs -- vacation time, holidays, seniority or what have you. We firmly believe that industrial health and safety is a matter of the widest public concern and should be accepted as such by all concerned.

In closing, I cannot resist quoting Tolstoy simply because, to me, his quote vividly portrays governments and industry's stance on the question of asbestos related diseases:

> "I sit on a man's back, choking him and making him carry me, and yet assure myself and others that I am sorry for him and wish to lighten his load by all possible means -- except by getting off his back".

PUBLIC BUILDINGS

The question of what to do with public buildings, which apparently have significant amounts of asbestos fibre in the air in their confines, cannot be dealt with in any one single way. Obviously, the first thing to determine is the level of concentration of asbestos fibres in the air in the building. It is equally important to determine the source of these fibres. Only after it is determined that the source of the problem lies in the type of material used in the construction of the building can a decision be made as to what, if anything, should be done to remedy the situation.

Suppose, for example, it is found there is an asbestos problem in a school because asbestos fibres are detected floating in the classrooms. The first course of action should be to determine, as accurately as possible, the level of concentration of the fibres and also the type of asbestos fibres in the classrooms or other parts frequented by the students.

Generally speaking, it is pretty safe to say that almost any level of concentration detectable by the techniques in use today should be considered as a potential hazard in schools simply because of the age of the inhabitants (students) generally found in schools. Mostly they are young people. As such, they have a comparatively greater number of years to live than do adults. Since asbestos related cancers and mesothelioma can be caused by even low levels of asbestos exposure if there is a sufficiently long lead time available for the development of these diseases, it follows that the probability of the development of adverse effects over a lifetime must be greater for young people than for mature adults -- assuming equal exposure.

In any event, once asbestos fibres are detected, there should be a determination as to the source of the contamination. If the source is within the building itself then some action must be taken to render the school safe and a decision must be made to remove the source, isolate it, or render it harmless.

Obviously, removal and substitution should be considered only if less costly, safe and effective materials are readily available. For example, it may be possible to cover the offending material with a coating of another substance that is harmless; and is fireproof and will not adversely affect the insulating qualities of the offending material. Or it may be possible to remove the hazard by some method of filtration of the air.

It is obvious that not enough research has been done to find a safe, effective and inexpensive procedure to make asbestos products safe. We feel very strongly that such research must be pursued more vigorously than ever and the funding should come from the industry and government.

Our position with respect to asbestos in hospitals and like public buildings is the same as for schools, albeit for obviously different reasons.

OTHER BUILDINGS

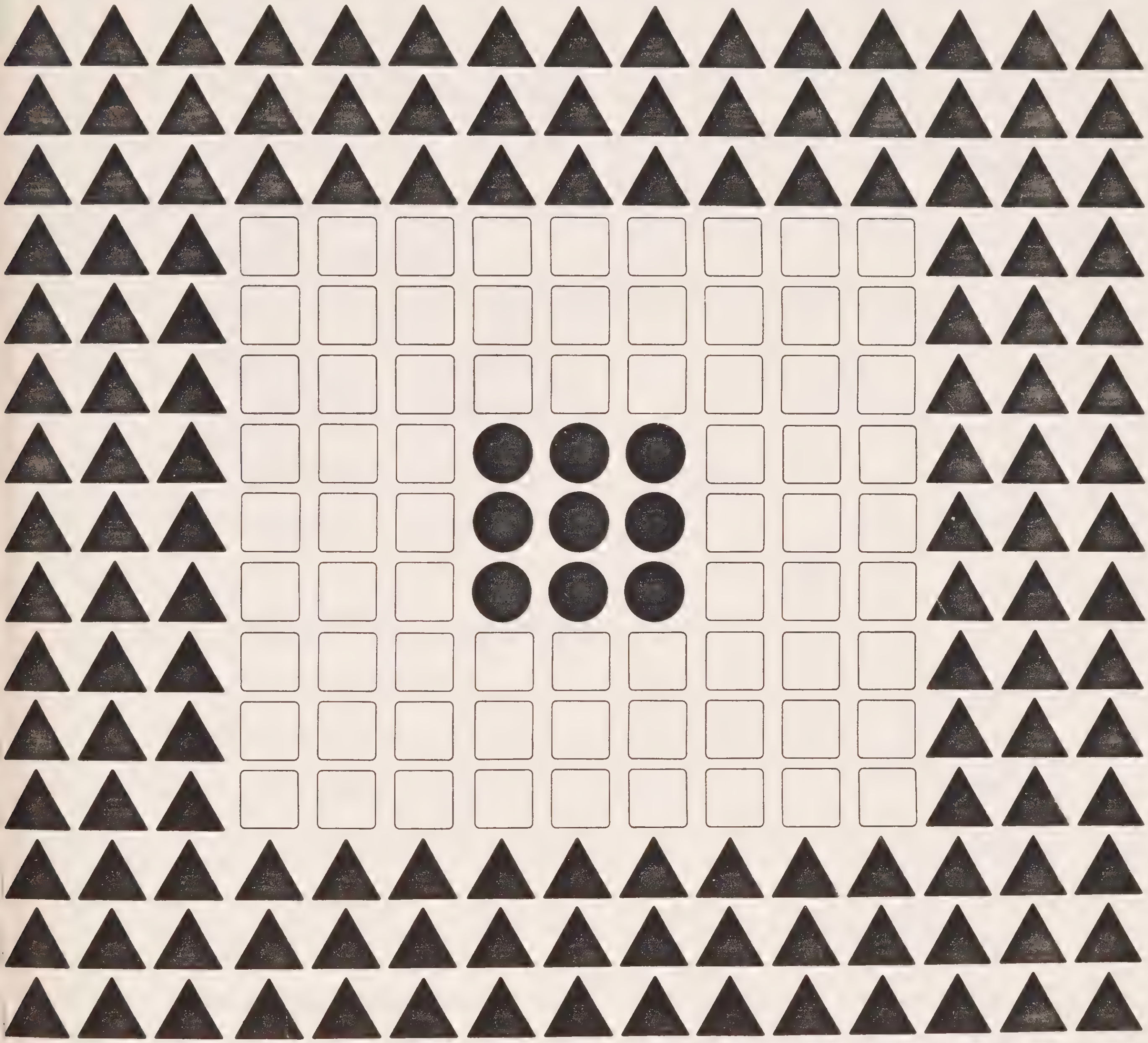
As for public buildings "other than schools and hospitals", our position is very slightly different. While we agree that all buildings should be made as safe as it is practically possible to do, our orders of priority place these "other" buildings lower on the totem pole.

As long as there is any tainting of attitudes by the "acceptable risk" concept, it would be obviously and grossly incorrect to suggest "other" public buildings should be made "safe" or "clean" at public expense unless at least an equally great emphasis is placed on the cleaning up of all work places at the employer's expense.

If any defenders of the "acceptable risk" approach to health matters suggest differently than above, they brand themselves as hypocrites by doing so!

Ontario
Ministry of
Labour

Occupational
Health and Safety
Division



BRIEF OF THE ONTARIO MINISTRY OF LABOUR
TO
THE ROYAL COMMISSION ON MATTERS OF
HEALTH AND SAFETY ARISING FROM THE USE OF
ASBESTOS IN ONTARIO
FEBRUARY, 1981

43

CONTENTS

A P P E N D I C E S

BRIEF OF THE ONTARIO MINISTRY OF LABOUR

TO

THE ROYAL COMMISSION ON MATTERS OF

HEALTH AND SAFETY ARISING FROM THE USE OF

ASBESTOS IN ONTARIO

PART I

INTRODUCTION

1. Identification and control of worker exposure to asbestos is part of the broad responsibility for occupational health and safety of the Ministry of Labour. Authority for limiting such exposure is set out in legislation and applied through workplace inspection, air monitoring and enforcement of control orders. These operational activities are supported by staff who maintain in-depth knowledge of the health and safety problems arising from toxic substances and advise on related matters of policy and control practice. Therefore, the Ministry is in a position to present a brief on topics which are of major concern to the Commission.

PURPOSES OF THE BRIEF

2. The brief is intended to inform the Commission about:
   - Ministry of Labour responsibilities for occupational health and safety and the manner in which they relate to the use and presence of asbestos;
   - policy, organization and technical considerations which shape Ministry action to limit asbestos exposure at work; and

- Ministry programs to reduce both exposure and the adverse effects of it when it occurs.

3. Throughout the brief, some familiarity is assumed with the physical characteristics of asbestos, its uses, the health hazards attributed to it, measurement techniques, and other concerns which have been subjects of study and publication in recent years.[1] Making this assumption permits concentration on the Ministry's role and activities without delving into the background and nature of the problems they are intended to alleviate or correct. However, where there is controversy about a practice or technique which is of immediate concern to Ministry activities, the background information required is provided.

AREAS OF GOVERNMENT RESPONSIBILITY

4. Several Ontario ministries are involved directly in controlling exposure to asbestos. The allocation of responsibility among them reflects the types of exposure about which the government must be concerned.

5. Descriptions of these exposure categories are given immediately below:

   - Direct Work Exposure - Exposure of workers mining, using, removing or otherwise working on asbestos or in the immediate vicinity of these activities.

---

[1]Two documents which summarize much of the information needed are:

(a) Advisory Committee on Asbestos: "Asbestos", (Final Report of the Advisory Committee) Her Majesty's Stationery Office, London, 1980.

(b) Zielhuis, R.L., "Public Health Risks of Exposure to Asbestos." (Report of a working group of experts prepared for the Commission of the European Communities Directorate-General for Social Affairs, Health and Safety Directorate) Pergamon Press of Canada Ltd., Toronto, 1977.

- Incidental Work Exposure - Exposure of workers to the presence of (not working on) asbestos in the workplace, for example, insulation in a school or factory.
- Worker Associated Exposure - Exposure of persons (e.g. family, travelling companions) associated with exposed workers who may carry asbestos on clothing, into a car, etc.
- Public Occupancy Building Exposure - Exposure of students, tourists, customers and others arising from the presence of asbestos in schools, theatres, stores, etc.
- Domestic and Leisure Time Exposure - Exposure from the use of products containing asbestos in the home and in leisure time activities and from its presence as a building material in a home.
- Environmental Exposure - Exposure arising from the presence of asbestos in drinking water and air and which includes exposure in the neighborhood of asbestos handling plants.

6. At the provincial level, work-related asbestos exposure is primarily, but not exclusively, a Ministry of Labour responsibility. The Ministry has full authority to deal with the first category mentioned, that is, direct exposure to asbestos at work and may have the most effective means of controlling the third - worker associated exposure. These are measures which limit the amount of asbestos workers carry away from the workplace through provision of showers, laundry facilities and separate lockers for street and work clothes. The Ministry of Labour also has responsibility for incidental work exposure in the private sector but other Ministries acting in the capacity of employer or having other financial responsibilities may be involved. The Ministry of Consumer and Commercial Relations has a role to play through the setting of design standards in the Ontario Building Code which is administered by municipalities.

7. Several Ministries share responsibility for controlling exposure to asbestos in public occupancy buildings. To the extent that they are places of work, the Ministry of Labour has a role which

may or may not encompass the total problem. The Ministries of Health and Consumer and Commercial Relations are involved, respectively, through their interests in public health and the enforcement of building standards. At the same time, Ministries with immediate interests, such as those of the Ministry of Education/Colleges and Universities in the schools, are concerned with controlling exposure in institutions even though they may have no explicit legal responsibility in this area.

8. Domestic and leisure time exposure is a shared responsibility of the provincial and federal governments. Both the Ministry of Labour, through limiting work exposure, and the Ministry of Consumer and Commercial Relations, through the Building Code, tend to limit sources of asbestos in housing. Their combined efforts should practically eliminate such sources in new housing but there is little if any control of those in place in older homes. Products containing asbestos are mainly the responsibility of the Canada Department of Consumer and Corporate Affairs and other federal agencies. Similarly, the Ontario Ministry of the Environment is concerned with asbestos exposure arising from ambient air and water and shares this area with several federal departments.

9. The fundamental nature of the Ministry's responsibility for asbestos related occupational health problems is the same as that for safety and health at work generally, that is:
   - to define objectives to be achieved in controlling health and safety hazards; and
   - to promote observance of such guidelines through inspection, analysis and enforcement activities.

   These two aspects of how the Ministry discharges its role with respect to asbestos are described and explained in Parts II, III and IV of the brief. Prior to this, some indication is given of the extent and nature of worker exposure to asbestos in Ontario.

WORKER EXPOSURE IN ONTARIO

10. The data required to prepare a comprehensive description of worker exposure to asbestos in Ontario are not available. Nevertheless, the types of asbestos found in workplaces, where these are located, and the number of workers employed in them can be described fairly fully from information gathered through Ministry inspection and monitoring activities. Although the data are obtained for administrative purposes, Ministry staff are convinced that they identify all of the more serious situations in which workers may be exposed to asbestos and many others in which the exposure levels may be of limited concern.

Types of Asbestos Present

11. The three major commercially used types of asbestos - chrysotile, crocidolite and amosite - have been used in Ontario. Ministry inspection and monitoring activities confirm this use. A very high proportion of the total amount of raw asbestos used is domestically produced chrysotile. Crocidolite and, for the most part, amosite are imported into Canada but are brought in in relatively small quantities. The principal user of crocidolite has been Canadian Johns-Manville Co. Ltd., in its transite pipe manufacturing activity in Scarborough which was discontinued in 1980. The extent to which asbestos is present in imported manufactured commodities is not known but there can be little doubt that some worker exposure results from processing and using these in Canadian industry.

Where Exposure Occurs

12. Exposure to asbestos may occur in almost any type of workplace. However, experience shows that the problem is likely to be most severe in those situations where asbestos is being produced or worked with in mining, manufacturing and construction.

13. Through the medical surveillance activities of the Chest Disease Section of the Occupational Health Branch, the Ministry is aware of a large number of industrial operations in which exposure to asbestos is encountered. In September 1980, 191 such employers were making use of this service with a very high proportion of these being manufacturers of products containing asbestos. In 1976, products made in Ontario that were known to have contained asbestos included asbestos cement pipe, fire proofing materials, floor coverings, gaskets and other packings, friction materials, insulation and other construction materials, filters and electrical insulation (see Table 1). Since 1976, the production of asbestos cement pipe has been discontinued, substitutes for asbestos insulation have come into wider use and developmental work is in progress to replace asbestos as a friction material in brake linings.

14. Asbestos has been widely used in construction for several decades with the most serious worker exposure arising from mixing and spraying asbestos insulation. During the early 1970s this spraying was practically discontinued (for detailed explanation see Part II, paragraph 37). Since that time, the principal exposure in the construction industry has been in demolition or remodelling of older buildings where asbestos had been used. However, materials in which the asbestos fibres are fixed and not likely to be a health hazard are still found in construction and some exposure may occur if these have to be cut or otherwise modified on site.

15. Only one asbestos mine (Hedman Mines near Timmins) employing 15 workers is operating in Ontario. Three others have been in production at some time during the past fifteen years but the last of these shut down in April 1977. However, asbestos dust may be present as a contaminant in the air in hard rock mines in Ontario as well as in crushed stone and talc mining activities. A mine of the latter type in which there is evidence of the presence of asbestos is operated by Canada Talc Ltd., in the Madoc area.

TABLE 1

ASBESTOS PRODUCT MANUFACTURERS IN ONTARIO

Companies	Location	Principal Products
Abex Industries Ltd.	Lindsay	friction materials
Able Gasket and Materials Ltd.	Weston	custom fabrication, gaskets
Canadian Durabla Ltd.	Belleville	gasket sheets
Canadian Johns-Mansville Co. Ltd.	Port Union	asbestos cement products
Certified Brakes	Rexdale	brake pads
Columbia Acoustics and Fireproofing Co.	Mimico	fireproofing materials insulations
Flintkote Co. of Canada Ltd.	Toronto	vinyl asbestos floor covering
Garlock of Canada	Toronto	packings and gasket sheets
Hill Machine and Asbestos Products	Downsview	construction materials
Holmes Insulation Ltd.	Sarnia	insulation materials
Insul-Coustics Ltd.	Blossom Park	insulation materials
Mintex Federal	Rexdale	friction materials
Raybestos-Manhattan (Canada) Ltd.	Peterborough	friction materials and textiles
Scott Laboratories Ltd.	Pickering	filters
Universal Insulations Company Ltd.	Aurora	electrical insulating materials

Source: Health and Welfare Canada Report of the Asbestosis Working Group, Subcommittee on Environmental Health (February 1976).

Note: Since 1976 when the Table was compiled, the Canadian Johns-Manville Co. Ltd. at Port Union has discontinued making asbestos cement products and Certified Brakes has opened a second plant in Mississauga.

Numbers Exposed

16. Statistics Canada employment data give little indication of the numbers of workers exposed to asbestos. Employment by industry is not an accurate guide to the numbers of workers exposed to asbestos because many industries make only limited use of the material and industry definitions do not segregate those where a high proportion of the work force comes into contact with it.

17. The Ministry has made some very general estimates of the numbers of workers who may be exposed to asbestos in mining and construction. While only 15 people in asbestos mining and 26 in talc mining appear to be subject to exposure, several thousands working in nickel, uranium, gold and other mines may be exposed because of the presence of asbestos in the rock containing these ores. In construction, approximately 700 workers are members of the International Association of Heat and Frost Insulators and Asbestos Workers. However, because of the nature of construction work and the fact that it includes renovation and demolition activities, a substantial proportion of the construction work force of approximately 230,000 in the Province may be exposed to asbestos from time to time.

18. An indication of the number of workers exposed in industries other than mining and construction is given by data made available through the chest disease survey activity of the Ministry. The survey covers all workplaces where inspection has revealed the presence of asbestos and medical surveillance has been recommended and the service offered. Employers participating in this survey identify their exposed workers, and a compilation of this data for September 1980 shows that approximately 13,000 were covered by the program. Inspection of this list suggests that almost 90 percent of these workers are in manufacturing enterprises. To this number, the 700 members of the International Association have to be added for a total of approximately 14,000 workers under medical surveillance.

19. There is growing concern about the risks of exposure to asbestos for those who occupy schools, offices, plants and other locations where it is released from products found in the environment. Among them are workers such as school teachers, office workers, plant workers, in fact anyone employed in buildings in which asbestos cement sheets have been used for walls, floors and ceilings, or in which ceilings were coated with asbestos for noise or fire installations and/or decoration. It is not possible to estimate the numbers of workers exposed in these situations, however, the Ministry has estimated that approximately 1,250 buildings in the Province contain sprayed asbestos insulation ~~or asbestos~~ in other forms, such as ceiling tiles, which could expose the occupants to it.

PART II

LEGISLATION AND GUIDELINES

20. The Province's occupational health and safety legislation has evolved from basic provisions contained in The Ontario Factories Act of 1884. Since that time, it has become more comprehensive in terms of worker coverage and the hazards controlled, and more detailed in the objectives and procedures established. These developments came about through extensive legislative activity which has been almost continuous during the past two decades.

21. By 1976, the legislation was contained in four provincial Acts and the associated Regulations and was administered by three different ministries as follows:

    The Industrial Safety Act, 1971 - Ministry of Labour
    The Construction Safety Act, 1973 - Ministry of Labour
    The Mining Act, Part IX - Ministry of Natural Resources
    The Silicosis Act - Ministry of Health

22. The recommendations of the "Report of the Royal Commission on the Health and Safety of Workers in Mines" (the Ham Commission report) published in August 1976, triggered a process of consolidation of all provincial health and safety legislation and the related administrative arrangements. Before the year ended, the Occupational Health and Safety Division was organized in the Ministry of Labour and charged with responsibility for the four Acts listed above as well as The Employee Health and Safety Act, 1976, which led to the establishment of the Division itself. On October 1, 1979 The Occupational Health and Safety Act, 1978, was proclaimed and replaced all these statutes.

THE CONTROL FRAMEWORK

23. The legislation has established a formal framework of definitions, objectives and procedures which are intended to

guide all of those directly engaged in eliminating or controlling health and safety hazards in the workplace. The formal or legislated framework is set out in broad terms in the relevant statutes and in greater detail in regulations and criteria or guides to practice which may be referenced in them.

24. Such referenced material is best illustrated by the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH)[2]. These values specify in numerical terms the airborne concentrations of individual contaminants to which it is believed most workers may be repeatedly exposed "without adverse effects" on their health. The TLVs are widely accepted throughout the western world as exposure limits.

25. Under Regulation 660/79, Sections 243(1)b; 244(1)b(ii) and 279, which currently applies in the mining industry in Ontario, a health and safety inspector is required to consider the TLV on asbestos, in coming to a decision about the safety of the air in a workplace where asbestos contamination is suspected. In contrast, the TLVs are not referenced in Regulations 658/79 and 659/79 which apply respectively to industrial establishments and construction but in practice the inspectors in these areas make extensive use of them in reaching decisions on workplace air quality.

26. In practice, the control framework has an informal or non-legislated component of recognized criteria or guidelines which are used in enforcing the legislation. Major elements of it are TLVs not referenced in legislation, specifications set out by the Canadian Standards Association, performance goals which have

---

[2] "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment With Intended Changes for 1980", Published by American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, 1980.

evolved out of the inspection and monitoring activities of the Ministry, and material contained in information sheets[3] published by the Ministry and intended to influence employer and worker behavior with respect to toxic substances. Although these guides are not entrenched in the law, they are used in interpreting and applying it. In this way they become an integral part of the framework generally accepted by employers and workers and, where this is not the case, a factor in obtaining court decisions requiring compliance. These non-legislated elements of the framework are illustrated under the heading "Reliance on Guidelines" which appears later in this Part.

27. It is government's responsibility to take the lead in establishing and maintaining the framework outlined above. To do this effectively, it requires input of information from representatives of workers, employers, communities, persons doing research on health and safety problems, ministry staff and special investigations such as that being undertaken by this Commission. The information required ranges from that which is necessary to understand the general directions of industrial and social change to such specific matters as the operating characteristics of a certain piece of machinery, hazards created by workplace layout, training requirements and many more. If the task is carried on in this way, the framework should, as the Ham Commission urged, continually exert a positive influence on the occupational health and safety practices of workers, employers and government.

LEGISLATION PRIOR TO 1976

28. Heavy concentrations of dust in the workplace were recognized as a health hazard long before asbestos was extensively used.

---

[3]Data Sheet #18, "Asbestos," Ontario Ministry of Labour, December, 1976 (under review).

Therefore, Ontario health and safety legislation did contain provisions appropriate to the control of exposure to asbestos at the time it was identified specifically as a serious occupational health hazard.

In General Industry

29. Ventilation and dust control provisions appeared in The Factory, Shop and Office Building Act at least from the 1920s onward. Section 41(1) of that Act required control of dust which "is inhaled by the workers to an injurious extent", and provision for ventilation as follows:

> "Ventilate the factory, shop or restaurant in such a manner as to keep the air reasonably pure and so as to render harmless, as far as reasonably practicable, all gases, vapours, dust or other impurities generated in the course of any manufacturing process or handicraft carried on therein that may be injurious to health."

However, asbestos was not mentioned separately in the legislation nor was the danger of exposure to it understood sufficiently well to make it a matter of particular concern.

30. Substantially the same provisions remained in The Factory, Shop and Office Building Act until it was repealed in 1964. However, during the 1950s it is known that inspectors appointed under the "Factories Act" began to check on the presence of asbestos in workplaces and participated in joint training provided by the Ministries of Health and Labour in which the problems of asbestos exposure were discussed. At the same time, levels of exposure to asbestos in serious problem situations were assessed through air sampling techniques against a criterion of 5 million particles of dust per cubic foot of air. However, no formal limit of exposure to asbestos was established.

31. The Industrial Safety Act of 1964 outlined much more fully than the "Factories Act" had done, the Ministry's authority to deal

with exposures to toxic substances in industry. For example, Section 8(1)(c) and (2) of this Act provided for inspectors to have the assistance of technical experts in examining and testing air contamination. At the same time, Section 26(2) gave extensive authority for making relevant regulations:

> "12. requiring and regulating protective clothing and safety devices for persons employed or working in any manufacturing or industrial undertaking or process or who are exposed to any hazards;
>
> 13. respecting any poisonous, dangerous or harmful material, substance or thing;...
>
> 20. respecting safe atmospheric conditions to which any person or class of persons in an industrial establishment may be exposed in the course of any employment;
>
> 21. respecting medical examinations of persons employed in an industrial establishment and the reports to be made of such examinations;
>
> 22. respecting the reporting by physicians and others of cases of affection from dangerous or harmful substances or industrial poisoning."

32. Ontario Regulation 196/64, which related to the Act, dealt with these matters in considerable detail. Section 20(c) of this Regulation made specific reference to asbestos as one of the air contaminants which must be exhausted from the workplace in a manner which would prevent it from returning. By this time asbestos was clearly recognized in legislation as a health hazard and the inspection and monitoring services were active in controlling exposure to it.

33. The industrial safety legislation was revised in 1971 making its provisions relating to toxic substances more specific and limiting the discretion of inspectors in interpreting and applying them. Sections 5, 80 and 81 of Regulation 259/72 mentioned asbestos along with other contaminants as substances

which, in defined circumstances, require medical examinations, labelling of containers and posting of notices of their presence. In addition, the legislation continued or updated other measures which contribute to the control of asbestos and related to such matters as ventilation, training, protective clothing and emergency measures. This legislation remained in effect until the proclamation of The Occupational Health and Safety Act, 1978, on October 1, 1979.

In Construction

34. Asbestos insulation materials were used extensively on boilers, furnaces, hot water and steam pipes and, to some extent, in building construction prior to and during World War II. However, it was not until 1949 or 1950 that application of asbestos to structural steel members and steel decking became commonplace. At that time, the safety and health legislation in the industry was The Building Trades Protection Act of 1911 which was administered by the municipalities. This Act focused almost entirely on safety and made no reference to health hazards.

35. The situation noted continued until 1962 when the first Construction Safety Act came into force. Inspection remained a municipal responsibility except in small centres and rural areas of Northern Ontario where it was undertaken by the Construction Safety Branch. In this Act, it was recognized that safety included freedom from health hazards as well as the traditional safety concerns. Section 31(3) of the Regulations made under the Act stated that no worker was to be present where there was hazard of injury from inhaling a noxious gas, fume or dust unless he was protected by mechanical ventilation or the wearing of a suitable respirator. Under this Regulation action was taken to ensure that the most serious situations of exposure to asbestos in construction were controlled.

36. In 1973 the Construction Safety Act was revised and full responsibility for administering it given to the Ministry of Labour. At the same time, some of the municipal construction inspectors were transferred to the Construction Safety Branch.

37. Prior to the revision of the Act, staff work was done on the development of procedures to protect workers from exposure when using sprays containing asbestos. Regulation 419/73 associated with the Act set out specific conditions under which such sprays might be applied. They included isolation of the spray area, off-shift spraying, use of respirators by the spray crew and others present, and effective clean-up and removal of excess material from the spray area before further work was done there. These stringent control requirements combined with careful enforcement by the Branch raised the cost of using asbestos sprays and quickly eliminated ~~the use of them~~. This was verified by monitoring practices and testing samples of insulation applied. Further confirmation of the change is given by the fact that major suppliers developed substitutes.

In Mining

38. As in industry in general, the problem of dust in mines was recognized before the extensive use of asbestos and the identification of the health problems associated with it. Accordingly, sections of The Mining Act (there were no regulations) provided for effective ventilation, water supplies for damping down dust and the use of respirators, all of which would tend to limit asbestos exposure without being targeted directly at it.

39. No specific exposure limits for asbestos ~~or other toxic~~ substances were established for mining operations under The Mining Act. However, as early as the 1930s silica dust measurements were made in the mines using konimeter sampling devices. To the extent that the results of these measurements

were used as a basis for reducing airborne dust levels, they may have contributed to limiting exposure to asbestos. In 1972 the Ministry of Health endorsed a guideline of 2 asbestos fibres greater than 5 micrometres in length per cubic centimeter of air and this became the target exposure level in Ontario mines.

RELIANCE ON GUIDELINES

40. Although no specific exposure limits were defined in the legislation, rather extensive use was made of them in the decades leading up to 1976. In 1947, the first TLV relating to asbestos was published and the Occupational Health Branch[4] of the Ministry of Health began to use it as a criterion or reference point for determining the recommendations to be made on the basis of the results of air sampling work. Whilst the TLV had no legal status in Ontario, it was used as a guide to good practice.

41. The 1947 TLV was 5 million particles per cubic foot of air (mppcf) based on impinger sampling and counting with a light field microscope. In actual fact, this was a count of all dust particles but it served as a basis for control of asbestos where it was present.

42. The TLVs are presented in three forms defined as follows:

- time-weighted average - is an exposure level determined by averaging air concentrations of a contaminant experienced over a normal eight hour workday or 40 hour workweek, making due allowance for the length of time of individual exposure levels;

---

[4]In July, 1920 the Division of Industrial Hygiene was formed in the Department of Health. To 1976 the Division went through a number of reorganizations and name changes. Approximately 6 months after transfer to the Ministry of Labour in December, 1976, the then Occupational Health Protection Branch was divided into the Occupational Health Branch and the Special Studies and Services Branch. To avoid confusion in this brief, wherever reference is made to activities of these branches or their predecessors the current branch names are used.

- short-term exposure limit - an average exposure level determined over a 15 minute period - such a TLV concentration should not be permitted more than four times during a workday with at least 60 minutes between exposures; and
- ceiling value - a level of exposure that should not be exceeded even instantaneously.[5]

The time-weighted average is the form most often referred to in applying the values. However, it should be noted that exposures above the average are permitted as long as (a) they do not exceed the short-term exposure limit or ceiling values, and (b) they are compensated for by an equivalent period of exposure below the time-weighted average level. The thresholds are reviewed annually by the ACGIH.

43. In January 1968, the Threshold Limit Value Committee published in the ACGIH Newsletter the following statement:

> "A limit of 5 mppcf, based on impinger samples counted by light-field techniques, is satisfactory to control exposures to most forms of asbestos. Crocidolite, however, has been shown to produce mesotheliomas in addition to the common asbestotic inflammations. Since no safe limit can be established for this form of asbestos at this time, until more definitive data are obtained, it is recommended that workers exposed to crocidolite be equipped with air supplied helmets."

This was part of a report outlining changes that the Threshold Limit Value Committee intended to introduce into the 1968 TLV listing. However, when the TLVs were released by the ACGIH for the year, the above statement was not included but rather a new intended TLV of 2 million particles per cubic foot or 12 fibres greater than 5 micrometres in length per cubic centimetre was published.

---

[5] See above, page 11, #2, Threshold Limit Values

44. In 1970 an intended TLV of 5 fibres greater than 5 micrometres in length per cubic centimetre, which was to apply to all types of asbestos, was published. This value was finally adopted by the ACGIH in 1973.

45. The Ministry of Health accepted the intended values published by the ACGIH in making assessments of asbestos exposure in Ontario industry. The Ministry of Labour, working with the findings of the Ministry of Health, continued to issue orders on the basis of these assessments.

46. In 1972, the Ministry of Health, in an effort to achieve greater control of exposure to asbestos, abandoned the TLV as a reference criterion. Its action was taken in response to research done in the United Kingdom which indicated that almost any exposure to asbestos might be hazardous to workers' health. The criterion used from that time onward by the Ministry of Health was 2 fibres greater than 5 micrometres in length per cubic centimetre of air. This change in practice was brought about through consideration by the Occupational Health Branch staff of the rapidly accumulating evidence on the adverse health effects arising from asbestos and the practical application of the lower limit in their work (see Appendix 1). The 2 fibres per cubic centimetre limit has been used by the Occupational Health Branch ever since, except that, in 1975, a level of 0.2 fibres greater than 5 micrometres in length per cubic centimetre was introduced for amphibole asbestos.

47. Thus the basis for government orders to control asbestos for the period of twenty-five years leading up to 1972 was the asbestos TLV and, for the nine years since that date, has been exposure limits defined by Ministry officials. Neither of these criteria have been specified in legislation but their use has been supported by general provisions of the relevant statutes.

THE HAM RECOMMENDATIONS

48. The recommendations of the Royal Commission on Health and Safety of Workers in Mines had a major impact on the approach to all occupational health and safety legislation in Ontario, not only that relating to the mining industry. Particularly important among its proposals were those relating to how responsibility is shared and control of toxic substances.

49. With respect to the former, the general thrust was to place the primary responsibility for health and safety at work on employers and workers. To facilitate achievement of this, the concept of an "internal responsibility system" was developed in the Commission's Report. While the main characteristics of such a system were outlined, the Commission recognized that these would vary from one workplace to another. However, elements on which it placed emphasis were mechanisms to improve worker/management interaction in the identification and resolution of health and safety problems, more direct worker participation in controlling problem situations, and an increased and freer flow of information within and between management, workers and government.

50. The recommendations pertaining to environmental hazards will be of particular interest to the Royal Commission on Asbestos. Thirty-two have to do with such hazards and several refer directly to asbestos. The main emphasis of these recommendations is to bring about more effective control of toxic substances and their effects through better information about their presence, the nature of the hazards they create, and the extent of exposure to them. Recommendation 110, which suggests that the Ministry be given statutory authority "to establish standards or guidelines for personal exposure to all toxic substances and hazardous physical agents," is particularly important from the legislative point of view and gave rise to much of the action described in the remainder of this Part of the brief.

POST-HAM LEGISLATION

51. The Employee Health and Safety Act of 1976 was the government's immediate response to the Ham Recommendations. It introduced joint labour-management committees for dealing with health and safety problems, the worker's right to refuse work in conditions he/she considered to be hazardous and a number of other major changes. However, it did not provide uniformity of health and safety legislation for all Ontario industry.

52. The consolidation of the legislation the Ministry wished to achieve required extensive revision of the existing laws and a great deal of consultation with the parties who would be affected by the changes planned. Such work made possible the passage of The Occupational Health and Safety Act, 1978, and the proclamation of it on October 1, 1979, after the three separate sets of regulations for general industry, construction and mining (respectively, Regulation 658/79, 659/79, and 660/79) had been developed.

53. Section 20 of the new Act gives the Minister or the appropriate Director extensive authority to prohibit or control the use of toxic substances in the workplace and defines the matters to be considered in making orders for this purpose. In addition, the Regulations pertaining both to industrial establishments and mining contain many specific objectives and practices to be complied with in connection with the presence or use of toxic substances which refer directly to ventilation, dust control, protective clothing, water supplies, sanitation and other areas of industrial hygiene. These regulations are intended to establish satisfactory protection of workers' health against most hazards.

54. Furthermore, to ensure the fullest possible protection of workers, the Act permits designation of specific substances which are of particular concern and the application of particular regulations. The relevant sections of the Act read as follows:

Section 41.-(1) "The Lieutenant Governor in Council may make such regulations as are advisable for the health or safety of persons in or about a work place.

-(2) Without limiting the generality of subsection 1, the Lieutenant Governor in Council may make regulations,

14. prescribing any biological, chemical or physical agent or combination thereof as a designated substance;

15. prohibiting, regulating, restricting, limiting or controlling the handling of, exposure to, or the use and disposal of, any designated substance."

DESIGNATION OF ASBESTOS

55. In recognition of the seriousness of the threat to workers' health posed by asbestos, the Ministry of Labour on June 28, 1980, published a notice of intent to designate it along with six other substances and noise. This was followed on August 16 by publication of the proposed regulation pertaining to asbestos and a request for public comment from workers, employers and others interested (see Appendix 2).

56. The proposed regulation for asbestos is based upon the concept of internal responsibility which is embodied in The Occupational Health and Safety Act, 1978. That is, it will involve both employers and workers in the design and implementation of programs that will protect workers against the hazards of exposure to asbestos in the workplace.

57. The structure of the proposed regulation was developed and the proposed exposure limits were selected following an intensive review of the medical and technical literature, an examination of the regulatory strategies used in other jurisdictions, and an analysis of public comments on an earlier draft of the regulation circulated in 1978. Based on this information, an occupational exposure limit was proposed together with a requirement for hazard assessment where asbestos is present in the workplace.

When such an assessment discloses that a worker's health may be affected by the exposure, the regulation would require that a control program be initiated by the employer.

58. The proposed regulation, when put into effect, will apply to all employers at a workplace where asbestos is present, processed, mined, used, handled or stored and at which a worker is likely to inhale or ingest asbestos.

59. The proposed regulation states that all employers to whom the regulation applies will be required to conduct an assessment of the likelihood of worker exposure to asbestos in order to identify actual or potential sources of exposure. When conducting the assessment and developing an appropriate control program, the employer must consult with the joint health and safety committee in the workplace in question. Section 8(2) of the Act provides for the establishment of a joint health and safety committee where "a regulation made in respect of a designated substance applies to a workplace."

60. Under the proposed regulation, if the assessment indicates that any worker is likely to inhale or ingest asbestos and that the health of the worker may be affected, the employer must develop a control program that must include provisions for:

- engineering controls and work practices to control worker exposure to asbestos,
- monitoring to determine airborne asbestos levels,
- maintenance of personal exposure records for workers,
- medical examinations and tests of workers,
- maintenance of medical records.

Exposure control must be achieved by means other than the use of personal protective equipment unless an employer establishes to the satisfaction of an inspector that special circumstances exist. Current practices with respect to the above matters are described in Part IV of the brief.

61. The proposed regulation requires employers to control the exposure of workers to airborne asbestos so that the exposure of each worker does not exceed prescribed limits. The levels at which these limits will be set are under consideration in the Ministry. Fifty-five briefs have been received as a result of publication of the proposed regulation. The views expressed in the briefs, research findings, and exposure criteria used in other jurisdicitons (see Table 2) are being anaylzed as a basis for selecting appropriate exposure levels for Ontario.

TABLE 2

PRESENT HYGIENE STANDARD FOR ASBESTOS IN 15 COUNTRIES

Country	Type of Asbestos	If Known TWA in Hours*	No. of Fibres per ml or Equivalent (unless otherwise stated)	Legislation or Guideline	When Legislation Took Effect (if known)
Australia	all		5 million parts/ft^3	harmful gases, fumes, mists, smoke & dust regulations	18.4.1977
Belgium	all		2	law in preparation	
Canada	all	8 hrs. 8 hrs.	5 Quebec 2 Ontario	each province has set of rules, e.g. Quebec has laws & regulations covering health & safety in mines and quarries	
Denmark	all		2	law	1972
France	all breathing zone air of workroom	working day	2 1	decree	20.10.77
Germany (Federal Republic)	dust 100% chrysotile dust less than 3.5% chrysotile (NB. precise limit in a give workplace depends on how much chrysotile there is in the dust when analysed by weight)		0.15mg/m^3 4mg/m^3	interlocking requirements from Federal Government Landergovernment Central Union of Trade Co-Operatives	
Ireland (Republic of)	crocidolite other		0.2 2	regulations	1972
Italy	all		5	guideline only	
Netherlands	crocidolite others		less than 2 2	decree	1.4.78
Norway	all		5	regulations	1973
Sweden	all (crocidolite banned)		1	regulations	1.7.76
South Africa	all			occupational diseases in Mines & Works Act	1973
SA	all ceiling for all employees	8 hours	2 10	regulations	1.7.76
SSR	all dust 10% asbestos dust 30% asbestos		2mg/m^3 1mg/m^3	regulations	
nited ingdom	crocidolite other	10 mins. 10 mins. 4 hrs.	0.2 12 2	regulations supplemented by guidance notes	1970

TWA = time weighted average

urce: Asbestos: Volume 2: Final Report of the Advisory Committee, page 95, London, 1979

PART III

ORGANIZATION AND STAFFING

62. The Ontario Government structure for dealing with occupational health and safety matters underwent a major change in late 1976. The organizational arrangements in place since that date are described, and a brief summary given of those previously in existence. In addition, liaison arrangements with other ministries which have responsibilities relating to exposure to asbestos are described.

ORGANIZATION PRIOR TO DECEMBER 1976

63. From the 1920s onward three Ontario ministries had major responsibilities for occupational health. Development of legislation, inspection and enforcement pertaining to industrial establishments and construction were carried out by the Ministry of Labour, and that pertaining to mining by the Ministry of Natural Resources. Occupational health support services were provided by the Ministry of Health. These services changed over the period but the provision of advisory medical services, investigation and monitoring of health hazards in industry, laboratory analysis of biological and air samples and materials found in the workplace, health studies, and medical surveillance for andustrial chest diseases were among them when the organizational change occurred in 1976.

64. Inevitably, the extent and quality of the relationships between the operating and service branches varied. Throughout the period in question, the Industrial Safety Branch relied heavily on health services for assistance in its work, and in return identified problem situations in which air monitoring, medical surveillance and hygiene counselling were required. A similar situation existed between the Occupational Health Branch and the mines inspectorate up to the mid-1970s. At that time, the Mining

Engineering Branch began to develop an air sampling capacity and became less dependent on Ministry of Health assistance. In part, it was the almost arms-length relationship between the service and inspection agencies and the need, in the Ham Commission's view, to expand the services of the Occupational Health Branch which resulted in its recommendations for organizational change.[6]

OCCUPATIONAL HEALTH AND SAFETY DIVISION

65. Acting on Recommendation 117 of the Ham Commission, the government established on December 16, 1976, an Occupational Health and Safety Division in the Ministry of Labour. The Division, headed by an Assistant Deputy Minister, takes the lead in policy development, dealing with major matters of public interest and the general direction of the six branches. The organization of the Division is outlined in Chart 1.

66. The 1980/81 complement of the Division is 758 positions and its budget is $27,125,000. Data showing the distribution of the complement and budget among the various branches are set out in Tables 3 and 4 respectively.

67. The services of the Division are made available through programs administered by its branches. Three of these - the Construction Health and Safety Branch; Industrial Health and Safety Branch; and Mining Health and Safety Branch - are engaged primarily in developing and delivering field health and safety services to workers and employers. In the main, these services are:

- inspection of work premises and practices for compliance with the health and safety legislation;
- advising and counselling employers, workers, and suppliers of materials and equipment on the requirements of the legislation and more generally on health and safety concerns;
- enforcing the legislation;

---

[6]"Report of the Royal Commission on the Health and Safety of Workers in Mines", Ministry of the Attorney General, Toronto, 1976, p. 252.

CHART 1

ORGANIZATION OF OCCUPATIONAL HEALTH AND SAFETY DIVISION

MINISTRY OF LABOUR

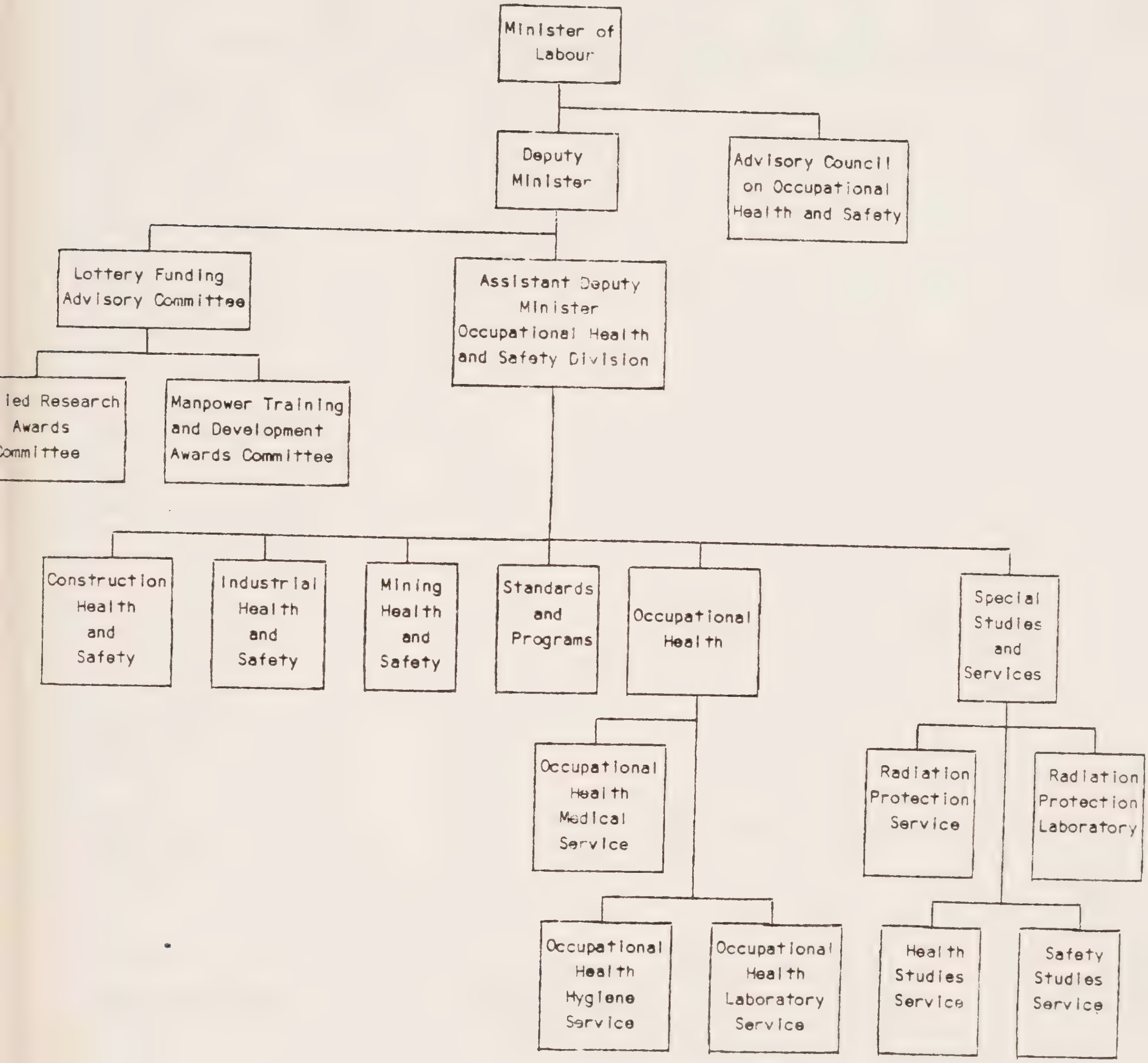


TABLE 3

COMPLEMENT

OCCUPATIONAL HEALTH AND SAFETY DIVISION AND BRANCHES

<table>
<tr><th></th><th>Prior to Ham Commission</th><th>Ham Commission Related Additions</th><th>1977-1978</th><th>1978-1979</th><th>1979-1980</th><th>1980-1981</th></tr>
<tr><td>Occupational Health and Safety Division</td><td>427</td><td>150</td><td>571*</td><td>595*</td><td>715</td><td>758</td></tr>
<tr><td>Office of ADM</td><td>3</td><td>3</td><td>5</td><td>5</td><td>5</td><td>5</td></tr>
<tr><td>Mining Health and Safety Branch</td><td>56</td><td>47</td><td>94</td><td>94</td><td>94</td><td>94</td></tr>
<tr><td>Occupational Health Branch</td><td rowspan="2">112</td><td rowspan="2">55</td><td>109</td><td>130</td><td>167</td><td>177</td></tr>
<tr><td>Special Studies and Services Branch</td><td>58</td><td>61</td><td>74</td><td>75</td></tr>
<tr><td>Standards and Programs Branch</td><td>42</td><td>20</td><td>59</td><td>61</td><td>77</td><td>80</td></tr>
<tr><td>Industrial Health and Safety</td><td>104</td><td>16</td><td>121</td><td>119</td><td>172</td><td>199</td></tr>
<tr><td>Construction Health and Safety</td><td>110</td><td>9</td><td>119</td><td>120</td><td>126</td><td>128</td></tr>
</table>

* includes Advisory Council 77/78-4, 78/79-5

TABLE 4

ESTIMATES (IN THOUSANDS OF DOLLARS)

OCCUPATIONAL HEALTH AND SAFETY DIVISION

	1976-77	1977-78	1978-79	1979-80	1980-81
Occupational Health and Safety Division	10,007	18,070	19,465	23,892	27,125*2
Mining Health and Safety Branch	1,613	3,136	3,101	3,300	3,376
Occupational Health Branch	2,291	2,812	3,408	4,837	6,353
Special Studies and Services Branch	320	1,650	2,412	2,685	2,906
Standards and Programs Branch*1	201	2,140	2,416	2,741	3,385
Industrial Health and Safety Branch	2,639	2,881	3,154	3,635	5,439
Construction Health and Safety Branch	2,721	2,791	3,040	3,232	3,557

*1 includes Office of Assistant Deputy Minister

*2 includes Mine Rescue Training $480 and Provincial Lottery $1,628

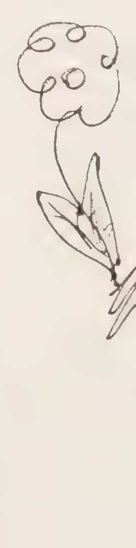
- maintaining descriptive records of Branch activities and the problems dealt with; and
- contributing to the development of policy and legislation.

68. The jurisdictions and asbestos-related work of each of the operating branches are outlined briefly below.

Construction Health and Safety Branch

69. This Branch administers The Occupational Health and Safety Act, 1978 in the construction sector and Ontario Regulation 659/79 which applies to construction work. The scope of its concern is the health and safety of the approximately 230,000 construction workers in the Province. They are engaged in all aspects of construction including erection, alteration, repair, demolition, dismantling and moving buildings and other structures, shafts, tunnels, highways, railways, sewers, water-mains and conductors of electrical energy, solids, liquids and gases. As already noted, exposure to asbestos is no longer a major concern in most new construction projects, and where it is likely to occur in altering and dismantling older buildings, contractors and workers are made aware of the necessary control practices and, the Branch inspectors assist in finding solutions to problems which arise.

70. The Branch's complement is 128 positions of which 115 are allocated to inspectors. In 1979/80 they carried out 65,650 inspections in the industry.



Industrial Health and Safety Branch

71. This Branch administers The Occupational Health and Safety Act, 1978 in industrial establishments and Ontario Regulation 658/79. Within its jurisdiction are all manufacturing, service, trade, transportation, storage, communications and other work sites in Ontario except those in construction and mining or those which come under the safety and health jurisdiction of the federal

government. The 1978 Act extended the Branch jurisdiction very considerably. A section was committed to development of its services in educational and health institutions, hotels, and in several more specific activities including policemen, firemen and window washers. It should be noted that until regulations are developed the Act does not cover teachers as defined in The Education Act, 1974, persons on the academic staff of universities and related institutions and those employed in farming.

72. The Branch has a major responsibility for identifying the use of asbestos in industry, obtaining the services of the Occupational Health Branch in evaluating the extent of exposure where asbestos is found and, where necessary, issuing orders for the control of exposure and ensuring that these orders are complied with. The predevelopment review work done by Branch engineers may also contribute to its efforts to control the use of asbestos.

73. The Branch has a complement of 199 positions including 129 allocated to field staff. During 1979/80 it completed 39,184 inspections in a jurisdiction which covers approximately three and three-quarter million workers.

Mining Health and Safety Branch

74. This Branch administers The Occupational Health and Safety Act, 1978 in mines and mining plants and Ontario Regulation 660/79. The Branch's work extends to over 200 mines, metallurgical plants, and clay, shale and peat workings plus approximately 5,000 sand and gravel pits. All of these operations employ approximately 66,000 workers.

75. As already explained, the Branch's role in controlling exposure to asbestos is largely limited to situations in which such air contamination occurs as a result of mining other minerals. However, in addition to its regular inspection activities, it has a staff of environmental technicians who carry out air sampling in mines to check on all types of airborne contamination. In the

one asbestos mine in the Province exposure levels are audited frequently. During 1980 selective audits were done on five different occasions.

76. The complement of the Branch is 94 positions; in 1979/80 it carried out 7,900 inspections and extensive work in the predevelopment review of new mines, plant and equipment.

77. The three service branches of the Division are distinguished by different types of activities rather than by operation in different industrial sectors as is the case with the inspection branches. The branches in question are Occupational Health, Special Studies and Services, and Standards and Programs.

Occupational Health Branch

78. This Branch supplies technical support services to the inspection activities of the Division and, through X-ray examination and pulmonary function tests, directly to industry. These services are rendered in the form of surveys and audits of industrial hygiene practices and facilities, measurement of the extent of contamination of workplaces by toxic substances and provision of advice on problems in these areas. These services are, for the most part, provided to the inspection branches but they are also available to other ministries and the Workmen's Compensation Board.

79. The Branch contains three services:

Medical Service - This group evaluates medical programs established by employers and advises on their adequacy and how they can be improved. It also assesses the need for and promotes the development of medical programs where they are not in place. Its other major function is to carry out medical surveillance through a chest X-ray service for workers exposed to asbestos or other substances which cause chest diseases.

Occupational Hygiene Service - This group undertakes field investigation and monitoring of exposure to chemical, physical and biological substances. In this work, air and other samples may be collected to ascertain the extent of exposure of workers. In addition, the hygiene staff examine the conditions of use of hazardous substances in industry and the control measures being applied to them.

Occupational Health Laboratory - This group provides an analytical service for collection and analysis of air samples to determine environmental contamination and of biological samples to assess absorption by individuals of toxic materials. Samples of materials found in the workplace are analysed to permit identification of toxic or hazardous components. With respect to asbestos alone, more than 3,500 such samples were analysed during 1980.

80. The Branch publishes a ~~quarterly journal,~~ "Occupational Health in Ontario", and its staff members assist in the development of legislation and guidelines. To do this, they maintain expertise in diagnosis of diseases due to the inhalation of asbestos or other materials and are well informed on related aspects of testing and control methods.

81. The total complement of the Branch is 177 positions filled by physicians, nurses, occupational hygienists, technicians and scientists. Approximately fifteen technicians have been trained to do optical counting of fibre concentrations in air. The Branch participates in programs of the National Institute of Occupational Safety and Health in the U.S. to maintain the quality of its performance in this area.

Special Studies and Services Branch

82. This Branch has two main areas of work. One is to improve understanding of occupational health and safety problems by making available the results of studies on health and safety and research on clearly defined practical problems. Its second area of activity is to monitor and advise on policy and operational issues relating to health and safety aspects of ionizing radiation and non-ionizing radiation.

83. Much of the Branch's work is of a project nature, indicated by the activities noted below:

- investigation of health problems associated with exposure to specific agents;
- evaluation of the health of particular groups of workers, such as uranium miners and workers exposed to silica or asbestos. For example, at the present time, the Branch is conducting mortality studies on two groups of asbestos workers;
- research on specific occupational safety problems;
- monitoring the use of radioactive materials where the Province has jurisdiction;
- participation in the preparation of contingency plans for, and provision of technical support in, emergencies relating to nuclear generating stations; and
- provision of technical support to the Ministries of Health and the Environment in matters relating to occupational and environmental health.

84. The Branch's involvement in asbestos is through studies of workers exposed to it carried out in its Health Studies Service. The Branch has a total complement of 75 of which 19 are in this Service, including 8 physicians and 1 statistician.

Standards and Programs Branch

85. This Branch is responsible for the development, co-ordination and evaluation of the Occupational Health and Safety Division

policies and programs. As part of this work, it assembles and analyzes data on workplace hazards and co-ordinates the development of legislation to control the exposure of workers to hazards in the workplace.

86. Work done in the Branch which has to do directly with asbestos includes:

- development of the proposed regulations on designated substances, including the one dealing with asbestos;
- development of background material to support designated substances regulations;
- in conjunction with the Ministry of Education/Colleges and Universities, development of the document "Inspecting Buildings for Asbestos";
- preparation of the publication "Asbestos in Public Buildings."

The Branch has a complement of 80 including 43 professional staff.

87. A "Divisional Management Committee" provides a means of overall co-ordination of Branch activities and formal enhancement of the normal day to day communications. Membership of the Committee consists of the Assistant Deputy Minister and the six Directors.

88. In connection with the work described above, members of the Occupational Health and Safety Division have prepared or participated in a substantial number of publications dealing with specific aspects of the control of and exposure to asbestos. These publications give an indication of some of the expertise in the area which is resident in the Ministry. A list of those released in recent years is contained in Appendix 3.

LIAISON WITH OTHER MINISTRIES

89. As noted in the Introduction several ministries are involved in controlling exposure to asbestos. The expertise available

varies, with the Ministry of Labour having particular strength in the medical aspects, testing and control of exposure. It is in a position, therefore, to advise and assist others with these dimensions of asbestos-related problems.

90. The types of co-operation which have occured demonstrate the nature of the advisory and analytical services provided:

(a) The Special Studies and Services Branch has traditionally contributed medical knowledge to the criteria-setting activities of the Ministry of the Environment. The Branch gathers and assesses background information on the human health effects of pollutants as a basis for suggesting criteria which indicate maximum concentrations appropriate for environmental protection. Because these pollutants may damage vegetation or animals at lower concentration levels than are harmful to people, the Branch's input is only one of those considered in environmental matters. The arrangement to provide such advice is a continuing one and is an important responsibility of the Special Studies and Services Branch.

(b) The Occupational Health Branch also works with the Ministry of the Environment in an advisory capacity. During 1980, concern about both worker and public exposure arose in connection with the disposal of waste asbestos products in landfill sites across the Province. The two agencies have co-operated in developing methods of transporting and handling the material which will protect both the workers and the public. These guidelines have been completed and publication by the Ministry of the Environment is expected early in 1981.

(c) In March 1980 a study of exposure to asbestos and other contaminants in the Toronto Transit Commission's subway system was undertaken jointly by the Occupational Health and Special Studies and Services Branches and the Ministry of the Environment. The Branches were involved in the air

sampling work and in writing the report. Although "no current or imminent health hazards" attributable to airborne contaminants were found, the Working Group recommended that abatement measures should be continued and achievement monitored.

(d) In addition to the sorts of joint action mentioned above, the Construction, Industrial and Mining Health and Safety Branches exchange information about possible sources of asbestos and other forms of contamination with staff members of the Ministry of the Environment. These exchanges facilitate the work of both Ministries.

(e) Technical assistance has been given mainly through providing other ministries with analysis for asbestos in bulk samples of materials found in public occupancy buildings. Such work has been done on materials present in hospitals and other health care institutions for the Ministry of Health and on behalf of the Ministry of Education/Colleges and Universities for school boards, colleges and other educational institutions. Also, the latter Ministry co-operated with the Standards and Programs Branch in preparing the publication "Inspecting Buildings for Asbestos" which has been made widely available.

(f) The Ministry of Government Services is responsible for the upkeep, maintenance and repair of all buildings owned by the Ontario Government, but this responsibility may be divided between the Ministry of Government Services and other ministries by written agreement. When concerns are expressed and requests are made in regard to identifying possible health hazards due to asbestos in public buildings the Ministry of Government Services takes bulk samples. These samples are then passed to the Ministry of Labour which analyzes them for positive identification of asbestos and which provides inspection, air sampling and direction as required in the event a critical situation develops in a government facility with respect to employee concern regarding asbestos.

An example of this co-operation is an extensive survey of the Macdonald Block complex and the Legislative Building at Queen's Park which was carried in April and May 1980 by the Occupational Health Branch.

(g) Finally, the Construction Safety Branch of the Ministry of Labour and the Building Code Branch of the Ministry of Consumer and Commercial Relations have worked closely together in limiting exposure to asbestos in construction. This has occurred in connection with developing long-term approaches to control and also in emergency situations. Such co-operation is facilitated by the fact that the two Branches have within their respective areas of responsibility very similar objectives on limiting adverse health effects from toxic substances.

PART IV

ASBESTOS CONTROL ACTIVITIES

91. In dealing with any hazardous substance in the workplace a three-stage approach is taken by the Ministry:

- identification of the presence or potential hazard of the substance in question;
- assessment of the extent of the problem; and
- institution of an appropriate control program, through the issuance of orders.

As a basis for improving and supporting these activities, the health experience of workers exposed to asbestos is monitored and studied.

92. All parts of the Division are involved in activities directed towards controlling asbestos exposure at work. The three inspection branches and the Occupational Health Branch share the immediate or field control activities. Between them they discover where asbestos is present, assess the seriousness of the exposure entailed, determine whether or not action is required to correct the situation, and see that this action is taken. In addition, the Occupational Health Branch carries on medical surveillance of exposed workers to make them aware of adverse health effects and to obtain an information base for improving understanding of the hazards arising from asbestos. As already indicated, the other two service branches give support through studies, research and developing policy and legislation. All of these activities, except policy development, are discussed at some length in this Part.

IDENTIFICATION OF ASBESTOS IN THE WORKPLACE

93. Asbestos is ubiquitous in nature because of the multitude of uses. Thus, it is present in almost all workplaces in some form ranging from loose fibres used in an industrial process to tightly-bound fibres in a floor tile or in a gasket material.

94. The front-line identification of occupational exposures to asbestos rests with the inspectors of the Construction, Industrial, and Mining Health and Safety Branches. They look for the use or presence of asbestos as part of their regular inspection process. Their identification of exposure is a preliminary one based on observation because they are not equipped to determine exposure levels accurately. However, where the situation is unambiguous, for example, where the asbestos is fixed in a durable substance, they may determine that its presence does not constitute a hazard. In other situations, further investigation of the extent of the hazard is sought from the Occupational Health Branch. The frequency of inspections varies between the Branches, which has a bearing on the identification process.

Construction

95. A construction project is a temporary worksite at which work may be done literally for a few hours or days up to several years, depending on the size and nature of the project (defined in Regulation 659/79, Section 4). Further, on any given project, a number of trades, probably represented by different unions, will take part, sometimes at the same time, but more often in serial fashion. Thus, for a large construction project, there could be steel erectors, welders, electricians, carpenters, plumbers, insulators and other workers.

96. Construction inspectors attempt to make at least one inspection at each project and return inspections at one- to two-week intervals throughout the duration of the job. Thus, there is an opportunity to discover the use of asbestos on almost all construction sites.

Industry and Institutions

97. Generally, an industrial establishment or a workplace under the extended coverage of the Occupational Health and Safety Act, 1978, is a fixed operation with a relatively stable work force. Work, while not necessarily the same from day to day, does tend to be repetitive over an extended period of time. Because of these factors, conditions may not require day to day changes in control procedures. Because of this relative stability, inspections are not made as frequently as in the construction and mining sectors. Accordingly, the Industrial Health and Safety Branch carries out cyclical inspections at intervals which can be as short as three months but most of which are at substantially longer intervals ranging from one to two years.

98. Inspectors in the field examine and make inquiries at each workplace for the presence of asbestos-containing materials. Where it is clear that exposure is at levels less than the current limits no action is taken but where there is any doubt the situation is referred to the Occupational Health Branch for investigation.

Mining

99. A mining operation is continually changing as ore is removed, as sections of the mine are depleted and as new producing areas are opened. Because of the shifting operation and the associated hazards, inspections are performed more often than in general industry. Asbestos products are used at most mine and mill sites.

100. The objective of the Mining Health and Safety Branch is to inspect every area of each mine (and mill) at least three times a year. This does not mean making a complete inspection every four months, but rather making frequent inspections with each one covering a portion of the workplace. Thus, in larger mines, an inspector may visit a mine site once or twice a week.

101. Because of the intensity of inspection, the Mining Health and Safety Branch was able to carry out a survey during 1979-1980 to determine all sources of asbestos in operations under its jurisdiction. The Branch will continue to audit these sources and require control measures as necessary.

Other Sources of Information

102. The Ministry has used sources of information other than the inspection process to determine the presence of asbestos. These serve to point to a small percentage of potential exposures and in all cases are verified by an inspection. Some of these sources are:

- companies where asbestos is present: (the identification occurs in the course of a predevelopment review, inquiry regarding control measures or medical surveillance, or direct action to inform the Ministry);
- unions representing potentially-exposed workers;
- individual workers or worker's family;
- medical Officers of Health;
- newspaper articles;
- Workmen's Compensation Board: (provides information when cases of asbestos-related disease are submitted as claims).

Confirming the Presence of Asbestos

103. Before extensive investigation or corrective action is undertaken in a workplace it is necessary to confirm the identification of asbestos. Basically, there are two approaches to such confirmation or verification:

- The presence can be determined by some form of documentation, such as purchase orders, product or building specifications and in some cases by the type of product involved, e.g. brake linings.
- Where there is any doubt about the product or material being or containing asbestos, an analysis is done to verify the content. There are many products, such as fiberglass, rockwool, cellulose insulation, etc., that resemble asbestos in appearance.

Laboratory analysis to determine or verify the presence of asbestos is difficult because the different types have different chemical compositions, shapes and crystal structures. As a result, care must be exercised in the choice of analytical method. Depending on the purpose of the analysis, a second method may be required to confirm or improve the information provided.

104. Several methods of analysis for asbestos are available. A summary is presented in Table 5 together with some comment as to the advantages and limitations. Apart from the technical limitations shown, costs, the availability of equipment and technical skill necessary to do the analysis must be considered.

105. Generally, electron microscope techniques are the most reliable in that fibre type may be identified with a high degree of accuracy even for very small diameter fibres. However, the analysis is time consuming and the equipment is expensive and requires skilled operation. One operator may be expected to complete the analysis of a single bulk sample per work day.

106. The polarized light optical microscope is a standard instrument used to aid the identification of minerals. It is used to discriminate crystal structures peculiar to any mineral substance, including asbestos. A trained and experienced operator is needed to carry out this technique effectively; the equipment is comparatively less expensive and the analysis time is shorter than for the electron microscope.

107. Where specific mineral forms are to be determined, a modification of the polarized light method called "dispersion staining" may be used. This depends on immersing the sample in oils of varying refractive indices close to those of the fibre types to be identified. The method provides a relatively fast means of identification which may be achieved by a person after a relatively short training period. The method is not suitable where the fibres are less than 0.5 micrometres in diameter.

TABLE 5

SUMMARY OF ANALYTICAL METHODS FOR ASBESTOS

Method	Feature Examined	Comment
Light microscope		
1. with phase contrast at 400X	morphology	limit of resolution about 0.5 μm
2. dispersion staining polarized light microscope (petrographic)	refractive index and morphology	skilled operators can distinguish asbestos fibres, limit of resolution about 0.5 μm
X-ray diffraction	crystal structure	no information on fibre size or size distribution
Infrared spectroscopy	characteristic absorption bands	ambiguity is possible, no information on fibre size or size distribution
Scanning electron microscope with microprobe	surface topology of the fibre and elemental analysis	most SEM's have a theoretical resolution limit of about 10.0 - 20.0 nm background can give interference
Transmission electron microscope with microprobe	shape outline, electron diffraction and elemental analysis	resolution limit down to 0.40 nm, transfer to grid can lead to statistical errors in counting

108. X-ray diffraction analysis provides information on crystal structure and may be used to identify mineral type; it does not provide information on fibre size or the proportion of fibre in the material. It is usually used as a means to confirm results initially identified by polarized light microscopy.

109. Infra-red spectroscopy gives results which may be inconclusive as to mineralogical content of the sample and provides no information on fibre size or proportion of fibres. The Occupational Health Laboratory approach to analysis is described in Appendix 4. This involves a preliminary assessment using the modified polarized light microscopic method with high dispersion oils of known refractive indices. Confirmation of identity is done by X-ray diffraction analysis. Using these methods, four laboratory analysts are capable of completing the analysis of about 100 bulk samples per week, providing identification of the type of fibre and estimation of the percentage content within discrete ranges.

HAZARD ASSESSMENT

110. It seems appropriate at this point to remind the Commission that the major thrust of the Ministry's program in occupational health and safety is to encourage development of internal responsibility systems in workplaces. Hence, under the proposed regulation the basic responsibility to identify asbestos sources, to carry out hazard assessments and to provide control programs will lie with the employer and workers. The Ministry, of course, will continue to have the responsibility to audit compliance.

111. However, for the purpose of administering its legislation, the Ministry carries out hazard assessment in workplaces. The purpose of such assessment is to determine if a worker's health is likely to be affected from exposure to asbestos and to determine whether or not control programs are needed. Hazard assessments are performed by staff of the Occupational Health Branch or, in mining, by staff of the Mining Health and Safety Branch. The personnel involved and their qualifications are noted below:

- Air Sampling Technicians - Persons usually with a diploma in chemical technology; they have special training in air sampling as well as in the preparation of samples and the counting of asbestos fibres in the sample collected.
- Occupational Hygienists - Persons with a university degree in engineering or science and with advanced training in occupational health hazards, including asbestos.
- Occupational Health Physicians - Persons licensed to practise medicine in Ontario and with advanced training in occupational medicine. They are knowledgeable about the hazards of toxic agents found in industry and can advise on the need for control programs and medical surveillance.

112. An assessment of the hazard potential of asbestos can be either visual or can entail more complex investigative methods.

113. Visual assessment is used primarily where asbestos is present as part of building materials such as insulation or where its use is minimal, such as in gaskets or packing material.
Such an assessment includes consideration of:
- the quantity of asbestos present or used;
- the condition of materials, e.g. whether flaking, loose or bound up in product and whether accessible; and,
- the numbers of people exposed and their opportunity to come in contact with it.

114. Using this approach, a trained hygienist or physician may determine either that a more careful evaluation is needed or that exposure is nominal, i.e. not likely to exceed the limit for occupational exposure.

115. Visual inspection, as described, is relied upon where it seems unlikely that a hazard based on occupational exposure criteria is present. Consequently, a subjective approach may be taken to determine potentially hazardous situations. Guidelines are

available which provide a numerical rating for assessing such potential hazards.[7]

Detailed Hazard Assessment

116. A more detailed assessment is necessary where there is direct continuous exposure to asbestos as part of the work operation. Such types of work include mining and milling, and manufacture of papers, pipes, brake linings, clutch faces, fireproof cloth, tiles, and other products containing asbestos.

117. A hazard assessment will usually entail a team approach and will include the following:

- determination of the amount and type of asbestos used,
- types of operations and conditions of use,
- number of persons exposed,
- evaluation of engineering control measures provided; while this is mainly ventilation control such evaluation includes review of the design of equipment, isolation procedures, wetting down, etc. used to prevent asbestos from becoming airborne,
- evaluation of work practices which include all procedures from taking care in handling asbestos to cleanliness and the use of protective clothing and respirators,
- examination of sanitary or hygiene facilities:
  - locker facilities,
  - shower and washroom facilities,
- evidence that eating and smoking is permitted in the workplace,

---

[7]Two examples are given in:

(a) Irving, Karen F.; Alexander, Rexford G.; and Bavely, Harold; "Asbestos Exposures in Massachusets Public Schools", American Industrial Hygiene Association Journal, April 1980, p. 270.

(b) United States Environmental Protection Agency, "Asbestos Exposure Assessment Algorithm", September 1979.

- determination of whether a medical surveillance program is in place for workers, and
- air sampling.

118. Using the information obtained, the investigator can decide on the magnitude of actual or potential hazards and can advise accordingly on the need for controls. A few examples of decision-making processes might include:

- Where, on visual inspection, asbestos is found to be well bound in place or encapsulated and not likely to enter the atmosphere, it would be determined that minimal hazard is present and no action need be taken. Such a decision could be confirmed using one of the numerical guides already referred to.
- If, on visual inspection, asbestos is found to be flaking or loose and might become airborne, albeit probably in low concentrations, then action to inhibit the release of asbestos would be recommended. The decision might be supported using a numerical index of hazard.
- Where air sampling results show concentrations in excess of the criterion, the report provided would indicate the likely cause, (e.g. insufficient ventilation, re-entrainment of settled dust) and orders would be issued.
- Where air sampling shows values below the criterion, but observation shows that reduction in airborne levels could be achieved by simple changes, then these would be suggested.
- Whether or not air sampling exceeds the criterion, observation may show inadequate work practices, such as poor housekeeping, or incautious handling of asbestos. Similarly sanitary facilities may be inadequate. For example:
  - if contaminated work clothes are worn home, worker exposure is increased along with the possibility of family exposure,
  - if street clothes and work clothes are kept in the same locker, there may be transfer of asbestos with fibres carried home.

  In such circumstances appropriate orders would be issued.

119. The combinations of circumstances found and possible solutions to problems, if they exist, are so numerous that individual "prescriptions" for control are necessary. To achieve proper asbestos control, the Ministry issues orders under the Act or Regulations for compliance by the employer.

Air Sampling Program

120. Concentrations of asbestos in air may be expressed on either a mass or fibre basis. Mass concentration is used in air sampling for asbestos in Warsaw Pact nations and West Germany and is based on gravimetric analysis of all dust collected on a filter with an assumption made as to the portion that is asbestos. Fibre concentrations are determined by using either an optical or an electron microscope to count fibres collected on a filter. The advantages and disadvantages of these different approaches are noted in Table 6.

121. Most jurisdictions use a form of the optical microscopy method for determining occupational exposures to asbestos. While the technique is not specific to asbestos and includes only fibres above 0.5 micrometres in diameter, it is readily available. In Ontario the method used is as set out in the "Code for Measuring Airborne Asbestos Fibres" which was published by the Ministry of Labour on August 15, 1980 (see Appendix 5).

122. This procedure involves collection of airborne dust and fibres on a 37 millimetre diameter membrane filter by drawing air through the filter at 2 litres per minute. Sampling duration is variable and may be up to four hours depending on the atmospheric burden. Often sequential samples of varying durations are taken to improve accuracy. The filter is subsequently treated so that fibres may be seen with a light microscope, using phase contrast illumination, at approximately X450 magnification.

TABLE 6

SUMMARY OF AIR SAMPLING METHODS FOR ASBESTOS

Method	Advantages	Disadvantages
Total mass	rapid simple cheap low operator skill needed	does not measure fibre concentration epidemiological studies[1] are all based on fibre concentration
Optical microscope counting	fairly rapid (1 operator can do 5-6 samples per shift) comparatively inexpensive there are epidemiological studies to support criterion	does not discriminate between fibre types microscope resolution is such that fibres of less than 0.5 μm are not seen
Electron microscope counting	resolution is such that almost all fibres are seen can identify fibre types	relatively slow and tedious procedure (1 operator can count a maximum of 2 samples per shift) expensive no epidemiological studies to support a value

1. Nevertheless, some jurisdictions (The Federal Republic of Germany and those in Eastern Europe) have chosen to use this method.

123. Two other laboratory procedures have been investigated by Ministry staff. Collection of samples using polycarbonate rather than cellulose acetate filters permits samples to be prepared sequentially for optical and then electron microscopy. Operator counting is still necessary though automated procedures for electron microscopy are under development. This approach permits direct comparison of samples using the conventional method with the superior resolution of the electron microscope and has the further advantage that single fibre identification is possible. It is, however, time consuming and expensive in respect of skilled operator time and equipment costs.

124. Collection of samples using silver membrane filters permits direct determination of the mass concentration of asbestos by x-ray diffraction analysis. This procedure is rapid and relatively inexpensive but does not permit determination of the size of fibres present though this may be readily achieved by simple microscope examination. Though attractive from the analytical viewpoint, practical application of this approach would require revision of the basis for the limit value, perhaps, after the manner adopted in the Federal Republic of Germany.

125. There is a capability for counting airborne levels of asbestos in both the Mining Health and Safety Branch and the Occupational Health Branch. During 1980 the Mining Health and Safety Branch carried out an air sampling survey in the one asbestos-producing mine in the Province and four others in mining establishments not producing asbestos. The Occupational Health Branch carried out 113 air sampling surveys for direct worker exposure in either industry or at construction sites. In addition a further 23 surveys were done where incidental worker exposure occured. Table 7 gives an indication of the number of such surveys conducted annually since 1970 by the Occupational Health Branch.

TABLE 7

AIR QUALITY ASSESSMENT REPORTS

OCCUPATIONAL HEALTH BRANCH

1970-1980

Year	Number of A.Q.A. reports
1970	9
1971	21
1972	19
1973	16
1974	23
1975	27
1976	33
1977	16
1978	32
1979	83
1980	136

CONTROL PRACTICES

126. While the Ministry can order control of asbestos, generally, it does not specify the measures to be used. It is the employer's responsibility to determine the most appropriate means of achieving control while the Ministry monitors the action taken and may give advice on how the necessary results can be achieved.

127. Generally, an asbestos control program will include one or more of the following measures:

- replacement of asbestos,
- engineering control,
- defined work practices,
- use of respirators of the proper type,
- administrative controls, and
- hygiene measures

Replacement of Asbestos

128. Where practical, this should be a first choice control measure wherever asbestos is present or being used. However, before substitution or replacement is attempted, consideration should be given to whether the substitute is less hazardous than asbestos and, if the asbestos is being removed prior to replacement, whether the hazard of removal is greater than that of leaving it in place.

Engineering Control

129. Engineering control covers a range of activities that may be carried out either to prevent dissemination of dust or to remove it. The term is intended to include measures which are built into the equipment or are part of the operation, and include the following:

- isolation - enclosing the source of asbestos or, in the case of a direct work exposure, moving the operation to a separate workplace or carrying it out at a time when other workers are not present. In buildings, for instance, installation of ceiling tiles may serve to isolate asbestos insulation.
- process modification - this includes any change in a process which reduces the emission of asbestos to the air. Examples of such process changes are the use of completely enclosed dumping as opposed to hand scooping, and air conveying under negative pressure as opposed to open conveyors.
- local suppression of dust - usually this is accomplished by wetting down asbestos before handling. Local suppression may include encapsulation and any other form of covering such as in a landfill site.
- ventilation - ventilation is the most common form of engineering control and usually both local and general ventilation are used together. Local exhaust is intended to remove asbestos at the point of generation of the dust so as to prevent it from entering the worker's breathing zone. Dilution or general ventilation provides an overall air exchange in a plant or work area so as to remove any asbestos that may be present in the air.

Work Practices

130. Work practices are activities adjunct to engineering controls and are intended to limit or prevent dissemination of dust or otherwise reduce exposure to asbestos. They differ from engineering controls in that they are not built into the process. Such work practices include:

- work habits - taking care in the handling of asbestos or asbestos-containing products;
- housekeeping - application of regular cleaning procedures using suitable vacuum cleaners, wetting down accumulations of asbestos and removing them by sweeping or other means;

- training - training workers in the hazards and proper handling of asbestos;
- information - using warning labels or signs on containers of asbestos and on products and work areas in which asbestos is present.

Respirators

131. Where measures to control exposure levels are not successful or where control measures are being installed or have temporarily failed, suitable respirators should be worn. Under the proposed asbestos regulation it is intended that the use of respirators will be allowed in only very limited circumstances. Where respirators are used, programs are needed to ensure:
   - proper selection of respirators;
   - proper fit to individual workers;
   - adequate maintenance after each use to include:
     - inspection and testing of respirators,
     - replacement of filters, valves, and other parts as necessary,
     - cleaning; and
   - training of workers in the use and care of respirators.

NOTE: In some cases, disposable respirators are used to reduce maintenance problems.

Administrative Controls

132. Where asbestos concentrations in air are above the permissible exposure level, it may be possible to reduce the exposure time by rotating jobs, or otherwise removing a worker from exposure. This should not be a primary means of control because its use often results in a larger number of workers being exposed.

Hygiene Controls

133. These consist of requirements which might include:

- no eating, drinking or smoking in the work place;
- leaving work clothing at the workplace and having laundry done in facilities provided at the workplace or at a facility aware of the asbestos hazard; and
- provision of sanitary lunchroom, washing, shower and locker facilities.

134. Normally, no one measure will provide a complete control program. Thus, a combination of the above will be used in any given situation.

MEDICAL SURVEILLANCE

Chest Disease Surveys

135. The Occupational Health Branch has provided a mobile chest X-ray service since 1947. Its purpose is early detection of occupationally related diseases including those caused by asbestos.

136. Entry to the program is through the employer being identified as having exposure situations which warrant medical surveillance of the workers located in them. The program is a dynamic one with companies being added and dropped as the need for it changes. As noted in Part I of the brief, in September 1980, there were 191 companies and one union in it and about 14,000 exposed persons covered. (see appendix 6)

137. Table 8 shows the number of X-rays taken since 1949. Until 1961, annual reports did not identify the type of exposure or the number of companies included. Since that date the type of exposure has been identified, while in more recent years the reports have separated exposure to asbestos and silica from that to asbestos alone.

TABLE 8

CHEST X-RAYS TAKEN BY CHEST DISEASE SECTION

OCCUPATIONAL HEALTH BRANCH

Year	Total Number of Chest X-Rays	Asbestos Exposure	Asbestos and Silica Exposure	No. of Asbestotics Found
1948	Unavailable			
1949	24,151			
1950	Unavailable			
1951	32,408			
1952	25,179			
1953	40,651			
1954	26,388			
1955	31,403			
1956	27,886			
1957	31,235			
1958	27,611			
1959	33,587			
1960	29,501			
1961	27,395	500		1
1962	35,717	800		1
1963	37,424	807		0
1964	32,728	1,609		10
1965	49,145	1,168		2
1966	48,320	1,195	808	11
1967	35,384	937	812	15
1968	46,543	2,103	879	16
1969	43,837	1,827	818	10
1970	32,837	1,649	813	6
1971	44,988	2,533	958	8
1972	44,763	2,484	1,223	4
1973	37,771	2,411	890	12
1974	41,754	1,470	1,887	8
1975	40,453	1,871	1,220	27
1976	29,197	2,378	1,614	6
1977	41.171	3,159	1,583	8
1978	40,217	2,507	1,597	17
1979/80	39,779	3,522	1,419	22
			TOTAL	184

138. Until 1979, surveys were done on a nominal eighteen-month cycle. In that year, the cycle was altered so that at present, all but six of the 191 employers are surveyed every two years. The six, which are considered to have the highest potential for exposure, are surveyed on an annual basis. At one company, Canadian Johns-Manville Co. Ltd., workers with over eighteen years' exposure are examined at six-month intervals. Construction insulation workers are also surveyed on an annual basis, but because they are reached through their local unions, their participation is voluntary.

139. Since 1968, pulmonary function testing has been carried out in addition to X-rays. Since that date these tests are reflected in the data shown in Table 8 for asbestos workers.

140. At the present time, reporting arrangements are as follows:

(a) A summary report is sent to management indicating the number of examinations made during a clinic, together with the number of occupationally-induced chest diseases that were found, without disclosing names of employees.

(b) Individual reports of all findings on each worker are sent to the plant physician with a sealed copy of each individual report to be given to the worker. The copy provided to the worker is intended for the family physician. If there is no plant physician, sealed reports now stamped "Confidential" are sent to the nurse or upper level management for distribution to the workers. This arrangement of having reports given directly to the worker was arrived at because information as to the name of the family physician was often found to be unreliable.

141. The Chest Disease Section has always been willing to provide advice to individual workers and family physicians on any disorders found. Where appropriate, they recommend on the submission of claims to the Workmen's Compensation Board. In addition, the physicians have worked closely with the WCB and

they act as members of the WCB Referee Board to advise on claims for chest diseases. The number of cases of asbestosis found through the clinics is included in Table 8.

142. In the mining sector, specific regulations require workers in dust exposures to be in possession of health certificates provided by Medical Officers appointed under the Regulation 660/79, Sections 273 to 277. Examinations, for the most part, are carried out in the examining stations operated by the Ministry of Health. The Chest Disease Section has working arrangements with the chest examining stations, especially in Northern Ontario.

Audit of Company Medical Programs

143. The Occupational Health Branch audits company medical programs where they exist, and evaluates the need for medical programs in other cases. In addition, physicians from the Branch advise on the need for medical surveillance and asbestos control programs.

144. The Ministry uses a set of guidelines prepared by the Occupational Health Branch in recommending the need for and character of employers' occupational health services for workers. (see appendix 7). The phamphlet, "Basic Principles for the Provision of Occupational Health Services" published by the Canadian Medical Association is a key element in them. Notwithstanding, these measures, where there is exposure to asbestos the proposed regulation will require establishment of medical services.

EPIDEMIOLOGICAL STUDIES

145. The Special Studies and Services Branch of the Ministry, as part of its mandate, prepares background documents on health effects of toxic substances which are used to assist in determining Ministry policies. Two examples of such review articles dealing

with asbestos are found in Appendices 8 and 9. In an article, "On an Occupational Standard for Exposure to Asbestos", the difficulty of setting a standard for asbestos that will prevent occupationally-induced cancer is considered. An attempt is made to evaluate the potential hazard of excess cancer at levels of 1 and 2 fibres per cubic centimetre of air.

146. In "Mortality Among Workers Receiving Compensation for Asbestosis in Ontario" (Appendix 10) it is shown that men with asbestosis have increased mortality rates from non-malignant respiratory diseases, lung cancer and mesothelioma. Their survival, compared with the general male population of Ontario, is only 69 percent at 5 years after compensation and 53 percent at 10 years.

147. The Branch has two major studies underway of asbestos exposed workers at the Canadian Johns-Manville Co. Ltd., Scarborough plant. Both are attempting to explore exposure-response relationships one by studying the mortality experience and the other the incidence of asbestosis in long-term employees. The broad objective is to develop an exposure model which may have practical application in understanding the hazards of asbestos and in the development of exposure limits.

PART V

CONTROL RESULTS AND PLANS

148. The brief indicates that Ontario has been at the forefront in controlling occupational exposures to asbestos. Some highlights of its activities include:

1. a medical surveillance program for asbestos workers initiated in 1947;
2. use of the Threshold Limit Values to assess worker exposures since 1947;
3. specific reference to asbestos in legislation since 1964, with general requirements earlier;
4. application in practice of a 2 fibre per cubic centimetre guide since 1972, with Ontario being one of the first jurisdictions in the world to have such a stringent criterion; and
5. legislated requirements on the application of sprayed asbestos insulation in buildings.

149. It is well established that workers generally contract asbestosis only after long periods from first exposure. This long latency period, which applies also to the development of cancer, means that it is not possible epidemiologically to measure results of a change in an exposure limit until approximately twenty years have elapsed. Asbestos-related diseases are occurring in the present from exposure many years ago. Therefore, since there was no change in the criterion for assessing exposures to asbestos from 1947 to 1969, any improvement in statistics related to asbestosis or cancer rates among workers would not be expected to become evident before at least 1990.

150. The only meaningful short-term way for determining the effectiveness of Ministry activities for controlling asbestos exposure is to show lower levels of asbestos in the air of workplaces. To do this on a comprehensive basis is costly and needs to be very carefully planned. Nevertheless, there is evidence that companies usually maintain exposure levels at about the current guideline and that improvement in performance has taken place as the criteria have been changed. This evidence is derived from the inspection and monitoring experiences of the Ministry which show that employers do attempt to comply with orders to reduce airborne levels of asbestos. The results of air sampling give some support to this view.

151. The Ministry is committed to maintaining a critical assessment of all information concerning asbestos as it relates to the responsibilities of the Occupational Health and Safety Division. Further efforts will be made to improve and refine the assessment of exposure to asbestos. This will require comparative studies with conventional optical microscopical procedures and collaborative efforts with other agencies.

152. The Ministry has plans for a more systematic approach to the auditing and monitoring of asbestos exposures. To this end scheduling of surveys and record keeping procedures are being updated at the present time and these should be in place before the fall of 1981.

153. Medical surveillance of asbestos workers will be maintained with more responsibility for this role placed on industry.

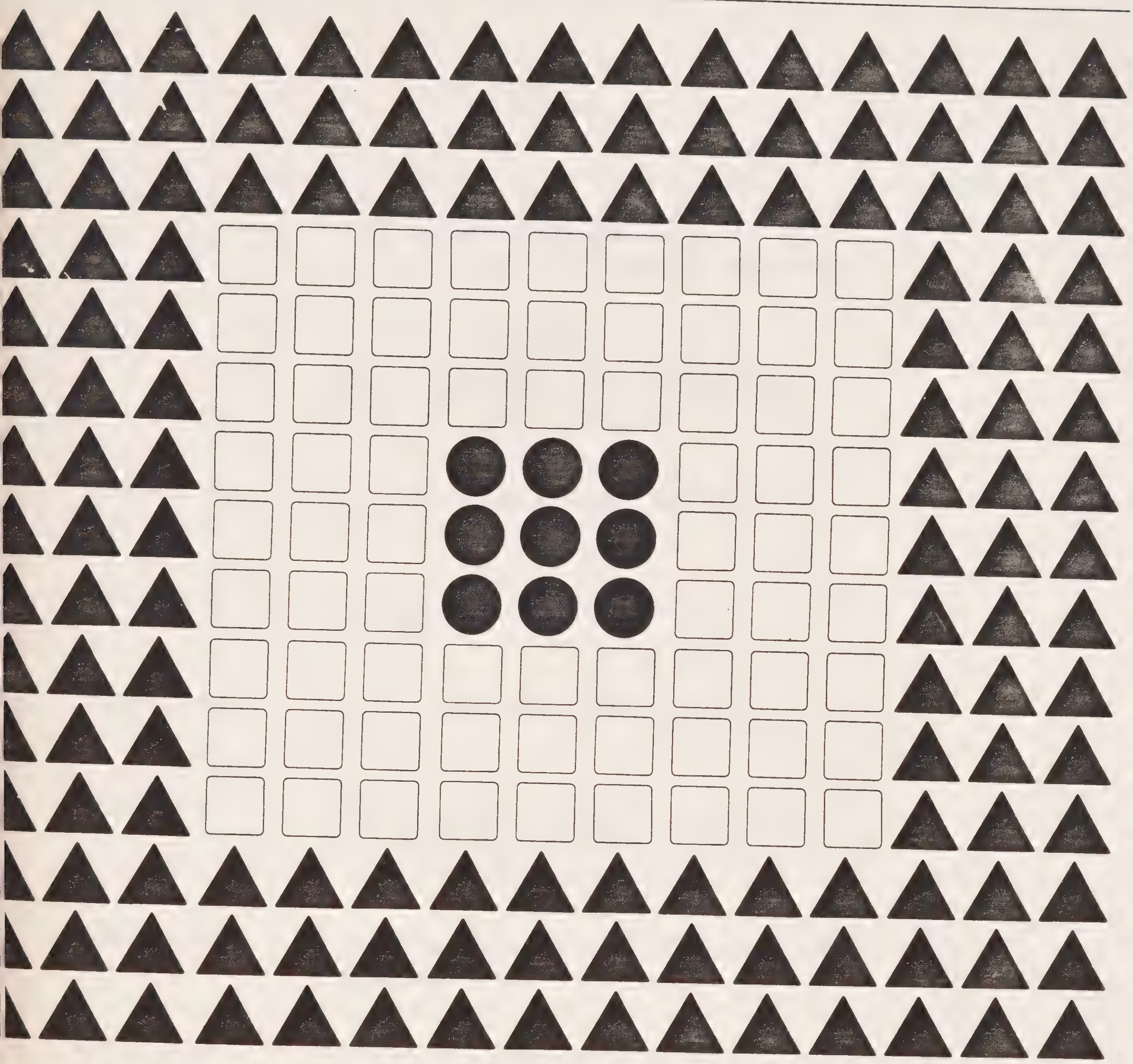
154. The Ministry intends to expand health studies among asbestos exposed workers. It is anticipated that the reports of such studies will be submitted for publication in the scientific literature.

155. The feasibility of establishing a register of all asbestos-exposed workers in Ontario is being considered. Such a register would include all present and future asbestos-exposed persons and any worker with past exposure who may be identified to or for the Ministry.

156. The Ministry expects to have an asbestos regulation in place during 1981. Control measures including the use of asbestos substitutes will be carefully studied to determine their application in the light of legislation. The Ministry is prepared to revise the regulation as new information is brought forward. The Commissioners' recommendations will be welcomed.

Ontario
Ministry of
Labour

Occupational
Health and Safety
Division



APPENDICES TO THE BRIEF OF
THE ONTARIO MINISTRY OF LABOUR
TO
THE ROYAL COMMISSION ON MATTERS OF
HEALTH AND SAFETY ARISING FROM THE USE OF
ASBESTOS IN ONTARIO
FEBRUARY, 1981

43

C O N T E N T S

APPENDIX 1.

Telephone:
965-4066

Area Code:
416

July 21,1972

Mr.
Superintendent - Friction Plant,

, Ontario,

Dear Mr.

I am sending you a copy of our air sampling results which were obtained recently at your plant by our laboratory, for your information. The Threshold Limit Value for impinger counts is about 3 m.p.p.c.f. and for fibre counts, the Threshold Limit Value is 2 fibres >5u/cc of air.

Yours very truly,

V.L. Tidey, M.D.,
Chief,
Occupational Health Service.

VLT:jt
encl.

APPENDIX 2.

THE PROPOSED REGULATION

UNDER

THE OCCUPATIONAL HEALTH AND SAFETY ACT, 1978

PUBLISHED IN THE ONTARIO GAZETTE AUGUST 16TH, 1980

ASBESTOS

OCCUPATIONAL HEALTH
AND SAFETY DIVISION

MINISTRY OF LABOUR

MINISTRY OF LABOUR

NOTICE OF PROPOSED REGULATIONS

The Ministry of Labour published Notice of Intention to designate substances to which the exposure of a worker is prohibited, regulated, restricted, limited or controlled under The Occupational Health and Safety Act, 1978.

The Notice of Intention appeared in the issue of the Ontario Gazette, Saturday, June 28, 1980.

Notice is given of the following proposed regulations relating to the designations of:

Asbestos
Lead
Mercury
Noise
Isocyanates
Silica, and
Vinyl Chloride

Attention is called to the provisions of section 22(b) of The Occupational Health and Safety Act, 1978, providing that the regulations may be filed with the Registrar of Regulations sixty days after the publication of the proposed regulations in the Ontario Gazette.

Comments on the proposed regulations or any particular sections therein may be addressed to:

Designated Substances Project,
Standards and Programs Branch,
Ministry of Labour,
400 University Avenue,
Toronto, Ontario
M7A 1T7

Comments received may be made available for public examination.

Robert G. Elgie, M.D.
Minister of Labour.

PROPOSED REGULATION UNDER THE OCCUPATIONAL HEALTH AND SAFETY ACT, 1978

ASBESTOS - DESIGNATED SUBSTANCE

1. In this Regulation,

   (a) "asbestos" means a fibrous asbestos mineral;

   (b) "fibre" means a fibre of asbestos longer than five micrometres with a length to diameter ratio not less than 3.1 as counted in a phase contrast optical microscope at 400-500 magnification;

   (c) "fibres/cc means fibres per cubic centimetre.

2. Asbestos is prescribed as a designated substance.

3. This Regulation applies to every employer at a work place where asbestos is present, processed, mined, used, handled or stored and at which a worker is likely to inhale or ingest asbestos.

4. (1) Subject to section 11, every employer shall, otherwise than by requiring a worker to wear and use respiratory equipment, control the exposure of a worker to airborne asbestos so that the time-weighted average exposure of the worker does not exceed,

   (a) in the case of amosite, 0.5 fibres/cc of air,

   (b) in the case of crocidolite, 0.2 fibres/cc of air, and

   (c) in the case of chrysotile or any other asbestos except amosite and crocidolite, 1.0 fibres/cc of air.

(2) Subject to section 11, every employer shall, otherwise than by requiring a worker to wear and use respiratory equipment, control the exposure of a worker to airborne asbestos so that such exposure does not exceed in any period of time,

(a) in the case of amosite, 2.0 fibres/cc of air,

(b) in the case of crocidolite, 2.0 fibres/cc of air, and

(c) in the case of chrysotile or any other asbestos except amosite and crocidolite, 5.0 fibres/cc of air,

(3) The time-weighted average exposure shall be calculated in accordance with the Schedule.

5. Upon receiving a report from the examining physician under subsection 1 of section 13 that the health of a worker has been impaired by exposure to asbestos, the employer may, with the approval of the Chief Physician, Occupational Health Medical Service of the Ministry, remove the worker from exposure to asbestos.

6. (1) Every employer shall cause an assessment to be made of the exposure or likelihood of exposure of a worker to the inhalation or ingestion of asbestos.

(2) In causing the assessment to be made, the employer shall consider and take into account such matters as,

(a) the methods and procedures used or to be used in the processing, mining, use, handling or storage of asbestos;

(b) the extent and potential extent of the exposure of a worker to the inhalation or ingestion of asbestos; and

(c) the measures and procedures necessary to control such exposure.

(3) In causing the assessment to be made, the employer shall consult thereon with the joint health and safety committee required to be established under clause b of subsection 2 of section 8 of the Act and the committee may make recommendations with respect to the assessment.

7\. (1) Where the assessment discloses that a worker is likely to inhale or ingest asbestos, and that the health of the worker may be affected thereby, an employer shall develop, establish, put into effect and maintain measures and procedures to control the exposure of the worker to asbestos.

(2) The measures and procedures mentioned in subsection 1 shall be incorporated into an asbestos control program.

(3) The asbestos control program shall include provisions for,

(a) engineering controls and work practices to control the exposure of a worker to asbestos;

(b) methods and procedures to monitor the airborne concentrations of asbestos in the work place and the exposure of the worker thereto;

(c) personal exposure records of a worker to asbestos to be maintained by the employer;

(d) medical examinations and tests of a worker including pre-placement and periodic medical examinations, X-rays and tests, but only with the consent of the worker; and

(e) records of medical examinations, X-rays and tests of a worker to be maintained by a physician who has examined the worker or caused the tests to be performed.

(4) In developing the asbestos control program, the employer shall consult with the joint health and safety committee and the committee may make recommendations with respect to the program.

8. Where a change is made in a process involving asbestos, or in the methods and procedures in the mining, use, handling or storage of asbestos and the change might result in a significant difference in the exposure of a worker to the inhalation or ingestion of asbestos, the employer shall cause a further assessment to be made forthwith and develop, establish, put into effect and maintain an asbestos control program to control the exposure of the worker to asbestos as a result of the change and the provisions of sections 6 and 7 apply to the assessment and the asbestos control program required by this section.

9. Where disputes arise between an employer and a joint health and safety committee as to an assessment required under section 6 or 8 or the asbestos control program required under section 7 or 8 or any provisions therein, the employer or a member of the joint health and safety committee may notify an inspector thereof who shall investigate and give a decision thereon in writing to the employer and the joint health and safety committee.

10. A copy of the asbestos control program shall be given by the employer to each member of the joint health and safety committee and shall be made available by the employer to every worker affected thereby.

11. (1) Respiratory equipment shall not be provided by an employer to be used by a worker except where an employer establishes to the satisfaction of an inspector that,

(a) the control of the exposure of a worker to concentrations of airborne asbestos as prescribed by section 4 is not feasible because the measures and procedures required to do so,

(i) do not exist or are unavailable, or

(ii) are unreasonable for the length of time of exposure or the nature of the work, or

(b) the control of the exposure of a worker to airborne concentrations of asbestos prescribed by section 4 is ineffective because of a temporary breakdown of equipment.

(2) Where respiratory equipment is provided by an employer and used by a worker the respiratory equipment shall be appropriate in the circumstances for the type and the concentration of airborne asbestos and shall meet or exceed the requirements set out in the Code for Respiratory Equipment for Asbestos dated the 15th day of August, 1980, and issued by the Ministry.

(3) The employer shall provide training and instruction to a worker in the proper care and use of respiratory equipment.

12.(1) The medical examinations and tests in an asbestos control program shall provide for,

(a) a pre-placement medical examination including,

(i) a medical history,

(ii) a physical examination, and

(iii) laboratory tests including analysis of blood or urine or both as required by the examining physician;

(iv) post-anterior and left lateral chest X-rays (356 mm x 432 mm) and pulmonary function tests including at least forced vital capacity (FVC) and forced expiratory volume in one second (FEV_1), and

(b) an annual or other periodic medical examination and tests and X-rays consisting of the items prescribed by clause a.

(2) The methods and procedures used to carry out pulmonary function tests shall be acceptable to the Chief Physician of the Occupational Health Medical Services of the Ministry.

13. (1) Where the health of a worker has been impaired by exposure to asbestos the physician who has examined the worker or performed or caused the tests of the worker to be performed shall report forthwith in writing his findings and recommendations to the worker, the employer, the Chief Physician, Occupational Health Medical Service of the Ministry, and with the consent of the worker, to his physician, if any.

(2) Upon the request of a worker or his authorized agent, reports of the results of medical examinations or tests shall be provided forthwith to the worker or his authorized agent.

14. (1) The employer shall provide a copy of the personal exposure record of a worker to the physician who examines the worker or performs or causes the tests of the worker to be performed.

(2) The records of medical examinations, X-rays and tests of a worker by the physician who has examined the worker or performed or caused the tests of the worker to be performed and the personal exposure records of a worker shall be kept in a secure place by the physician and the employer, as the case may be, for,

(a) a period of forty years from the time such records were first made; or

(b) a period of twenty years from the time the last of such records were made,

whichever is the longer.

(3) Where the physician or the employer, as the case may be, is no longer able or willing to keep the records, the records shall be forwarded to the Chief Physician, Occupational Health Medical Service of the Ministry, or a physician designated by the Chief Physician who shall keep them in a secure place.

(4) The records of medical examinations, X-rays and tests and the personal exposure records of a worker shall be made available to the worker or his authorized agent.

15. Subject to section 18, the procedure for determining the airborne concentration of asbestos in the atmosphere of a work place or to which a worker may be exposed shall be the procedure set out in the Code for Measuring Airborne Asbestos Fibres dated the 15th day of August, 1980, and issued by the Ministry.

16. The results of air monitoring in the work place under the asbestos control program shall be,

(a) posted forthwith by the employer as soon as the results are available in a conspicuous place or places at the work place where they are most likely to come to the attention of the workers for a period of at least fourteen days;

(b) furnished to the joint health and safety committee; and

(c) kept for a period of at least five years.

17. The personal exposure records of a worker to be maintained under the asbestos control program shall identify the worker, including his date of birth and the maiden surname of his mother, his jobs or occupations at the work place, the work operations performed by him during his employment, the results of monitoring for his exposure to airborne asbestos, his exposures to asbestos and the dates and length of time the worker used respiratory equipment and its type.

18. For the purposes of this Regulation the methods and procedures that may be used or adopted to determine the airborne concentration of asbestos in the atmosphere of a work place or to which a worker may be exposed may vary from the Code issued by the Ministry if the factors of accuracy and precision used or adopted are equal to or exceed the factors of accuracy and precision in the Code issued by the Ministry.

19. (1) The Ministry may approve laboratories for the purposes of carrying out and performing analyses and tests of airborne concentrations of asbestos.

(2) Analyses and tests of the airborne concentrations of asbestos in a work place or to which a worker may be exposed shall be carried out and performed by laboratories approved by the Minister.

20. (1) This Regulation, except sections 4, 7, 8, 10 to 12 and 14 to 18 come into force on the day this Regulation is filed.

(2) Sections 4, 7, 8, 10 to 12 and 14 to 18 come into force ninety days after the day this Regulation is filed.

SCHEDULE

The time-weighted average exposure of a worker to airborne asbestos shall be calculated as follows:

1. The average concentrations of asbestos to which a worker is exposed shall be determined from analyses of air samples taken as being representative of the exposure of the worker to asbestos during work operations.

2. The results of the analyses are the concentrations expressed as the number of fibres per cubic centimetre of air.

3. The concentrations shall be multiplied by the time in hours to which the worker is taken to be exposed to such concentrations.

4. The weekly exposure shall be calculated as follows:

$$C_1 T_1 + C_2 T_2 + \ldots C_n T_n = \text{cumulative weekly exposure,}$$

where C_1 is the concentration found in an air sample and T_1 is the total time in hours to which the worker is taken to be exposed to concentration C_1 in a week.

5. The time-weighted average exposure shall be calculated by dividing the cumulative weekly exposure by 40.

APPENDIX 3.

PUBLICATIONS ON ASBESTOS BY MINISTRY PERSONNEL

Ministry Publications:

"Asbestos" - Occupational Health Service Data Sheet #18 - First published March, 1969. Updated December, 1976.

"On an Occupational Standard for Exposure to Asbestos" - August 1978, Finkelstein, Dr. M.

"Inspecting Buildings for Asbestos" - December, 1979. Published in co-operation with Ministry of Education/Colleges and Universities

"Asbestos in Public Buildings" - March, 1980.

Other Publications:

"Fibrous Dust - Its Measurement and Control" - Canadian Institute of Mining and Metallurgy Bulletin, August, 1970, Rajhans, G.S.

"A Statistical Analysis of Asbestos Fibre Counting in the Laboratory and Industrial Environment" - American Industrial Hygiene Association Journal, December, 1975, Rajhans, G.S., and Bragg, Dr. G.M.*

"Here's an Update on Asbestos" - Occupational Health and Safety, November/ December, 1977, Rajhans, G.S.

"The Technical Aspects of Asbestos" - A background document for the Committee on Policies and Poisons, of the Science Council of Canada, 1977, Assad, Dr. J.R.** and Rajhans, G.S.

Engineering Aspects of Asbestos Dust Control - published by Ann Arbor Science Publishing Inc., Ann Arbor, Michigan, 1978, Rajhans, G.S. and Bragg, Dr. G.M.*

" A Review of Asbestos Expsoure in Ontario" - American Industrial Hygiene Association Journal, September, 1978, Rajhans, G.S., Bragg, Dr. G.M.* and Morton, J.S.

Submitted for Publication:

Asbestos Sampling and Analysis - Ann Arbor Science Publishers Inc., Ann Arbor Michigan. Scheduled for early 1981 publication, Rajhans, G.S. and Sullivan, Dr. J.***

"A Technique to prepare Asbestos Air Samples for Light and Electron Microscopy" Pang, T.W.S. and Robinson, Dr. A.E.

"Mortality of Workers Compensated for Asbestosis in Ontario" Finkelstein, Dr. M. and Kusiak, R.

* Waterloo University, Waterloo, Ontario

** Laval University, Quebec, P.Q.

*** University of Western Ontario, London, Ontario

APPENDIX 4.

The Determination of Asbestos in Bulk Samples

(Method presently used at the
Occupational Health Laboratory,
Ministry of Labour)

The Determination of Asbestos in Bulk Samples

1. Principle of Method

(1) Bulk samples, approximately 5 to 10 grams, are obtained from materials such as insulation, talc, brake shoes, gaskets or other materials suspected of containing asbestos.

(2) Portions of the sample are examined under a petrographic microscope. Asbestos is identified by the fibrous morphology and optical properties and classified as being (1) chrysotile, (2) crocidolite or (3) amphibole asbestos. The latter includes tremolite, cummingtonite, grunerite, anthophyllite and actinolite.

(3) A representative portion of the sample is analyzed by X-ray diffraction to confirm the presence of serpentine and/or amphibole minerals.

2. Apparatus

(1) Zip-lock plastic bags to contain samples.
(2) X-ray diffraction equipment with cobalt X-ray target.
(3) Sample holders for X-ray equipment.
(4) Mortar and pestle.
(5) A pair of tweezers.
(6) A petrographic microscope capable of magnifications up to 450 times and equipped with polarizer, analyzer and gypsum compensator.
(7) Glass microscope slides.
(8) Glass coverslips for microscope slides.

3. Reagents

(1) Cargille immersion oils, with refractive indices ranging from 1.52 to 1.70.

4. Procedure

(1) The bulk sample is examined and a representative portion is taken by means of tweezers.
(2) If necessary, the portion of sample is crushed using mortar and pestle.

X-Ray Diffraction Analysis

(1) The sample is mounted in the sample holder and analyzed using X-ray diffraction by scanning over the angle range of approximately 9^{o} to 40^{o} 2θ.
(2) The d-spacings of the peaks present are calculated and compared to asbestos diffraction patterns as published by the Joint Committee On Powder Diffraction Standards. The major peaks of asbestos are listed in Table 1.

Microscopic Analysis

(1) Using tweezers, a portion of the sample is placed in an appropriate immersion oil on a glass microscope slide and covered with a coverslip.
(2) Using magnifications from approximately 60X to 450X, the sample is examined for the appropriate optical properties listed in Table 1.
(3) The microscopic examination is repeated as necessary to identify all the fibrous components and to estimate the amount of asbestos present in the bulk sample.

5. Calculations

(1) The d-spacings of the X-ray peaks are calculated from the 2θ angle using the following equation:

$$\text{d-spacing in } \mathring{A} = \left(\frac{2\sin\left(\frac{2\theta}{2}\right)}{1.7889}\right)^{-1}$$

(2) This equation will differ if another X-ray source (i.e. not cobalt) is used.

Table 1. Properties Used in the Identification of Asbestos

Name / Property	chrysotile	amphibole asbestos excluding crocidolite	crocidolite
Major X-ray d-spacing diffraction peaks	7.3Å 3.7Å 4.6Å	8.4Å 3.1Å 3.3Å 2.7-2.8Å	8.4Å 3.1Å 2 2.7Å
Size	length to width ratio at least 3 to 1	length to width ratio at least 3 to 1	length to wic ratio at lea 3 to 1
Colour	colourless to grey	colourless to grey	pleochroic- greenish-blu
Form	bundles of fibrils, generally wavy fibrils diameter of fibrils less than resolution of the O.M. ie.0.5 μm	bundles of fibrils, generally straight fibrils	bundles of fibrils, generally straight fibı
Cleavage	along the axis of the fibre	along the axis of the fibre	along the axi of the fibre
Refractive Index	N_α = 1.49 to 1.55 N_β = 1.50 to 1.55 N_γ = 1.52 to 1.56	N_α = 1.60 to 1.66 N_β = 1.61 to 1.70 N_γ = 1.62 to 1.70	N_α = 1.69 N_β = 1.70 N_γ = 1.70
Birefringence (Interference Colour)	1st order grey to yellow	1st order to second order moderate	1st order-may be obscured colour of fit
Extinction	parallel extinction length slow (positive sign of elongation)	parallel to oblique extinction length slow (positive sign of elongation)	extinction an 3^o to 5^o som times parall length fast (negative si of elongati

6. Range and Sensitivity

(1) Fibres less than about 5 μm long and less than about 0.5 μm wide cannot be identified since they are below the resolution of the microscope.
(2) Asbestos fibres in concentrations of less than about 5% may not be detected by means of the X-ray diffraction analysis.
(3) Asbestos fibres in concentrations of more than approximately 0.5% can be detected by means of the microscopic examination.

7. Precision and Accuracy

(1) Asbestos fibres can be identified.
(2) The precision of the method is limited by the subjective interpretation of the analyst and inhomogeneity within the sample. Therefore, the amount of asbestos is reported as a percentage range.

8. Presentation of Results

(1) The following forms of asbestos are identified and reported individually: Chrysotile, Crocidolite, Amphibole asbestos (excluding crocidolite).
(2) The estimate of the concentration of asbestos, by volume, is reported as one of the following:

(a) none detected (detection limit 0.5%)
(b) less than 5%
(c) 5% to 25%
(d) 25% to 50%
(e) 50% to 75%
(f) more than 75%

9. Interferences

(1) Minerals of the serpentine and amphibole groups exhibit the same X-ray diffraction patterns as chrysotile and amphibole asbestos, respectively. Therefore, mineral fibres exhibiting the appropriate optical properties and a length to width ratio of at least 3 to 1 must be found using the petrographic microscope before asbestos can be confirmed as being in the sample.
(2) Cellulose fibres, if present in large quantities, may interfere with the analysis. The cellulose can be removed by ashing in a furnace at approximately 400°C for one hour.

Prepared
on January 9, 1981.

ANALYTICAL PROCEDURES USED BY THE OCCUPATIONAL HEALTH LABORATORY WILL BE REVIEWED PERIODICALLY AND, IF NECESSARY, REVISED.

APPENDIX 5.

CODE FOR MEASURING AIRBORNE ASBESTOS FIBRES

TABLE OF CONTENTS

AUGUST 15TH, 1980

OCCUPATIONAL HEALTH
AND SAFETY DIVISION

MINISTRY OF LABOUR

PERSONAL* SAMPLING METHOD

1. Principle of the Method

A measured volume of air possibly containing asbestos fibers** is filtered through a cellulose ester filter of specified pore size held in an open-faced holder. A randomly selected section of the exposed filter is then mounted on a microscope slide containing a drop of solvent which causes dissolution of the filter with minimum fiber migration to form a transparent optically homogenous gel. The slide is mounted on a microscope stage and the fibers are counted at 400 to 450 times magnification by a specified procedure. The average number of fibers counted per field of view of the microscope is used to calculate the concentration of airborne fibers.

2. Equipment

The equipment required to obtain a sample and perform an analysis for airborne fibers should include the following components and satisfy the criteria outlined below:

(1) Sampling Equipment

(a) A battery operated, portable pump which should:

(i) be capable of delivering for a full workshift, 2 or more liters of air per minute; the maximum deviation from the prescribed flow rate should not exceed $\pm5\%$ and the maximum pulsation allowable in the flow is $\pm5\%$ of the total flow rate.

(ii) be intrinsically safe when necessary, i.e. be certified by an accepted agency as safe for use in potentially

---

* This method may also be used for area sampling at locations which represent a work station exposure for asbestos fibers by placing a sampling unit on a suitable support in the same way as it would be placed on a worker.

** "Asbestos" means all those crystalline fibrous minerals, which includes the serpentine and the amphibole mineral group; serpentine means Chrysotile and amphiboles include amosite, crocidolite and tremolite.

"Fiber" means an asbestos particle with a length to diameter ratio of 3 to 1 or higher.

"Fiber/cm^3 means the number of fibers greater than 5 um in length, per cubic centimeter of air.

explosive atmospheres;

(iii) include a calibrated flow meter, volume meter or a mechanism for maintaining a prescribed flow rate;

(iv) have an on-off switch and flow rate control mechanism, which are as tamper-proof as practicable.

(b) A 37 millimeter inner diameter filter holder which is:

(i) capable of being used for open-faced sampling;

(ii) equipped with an adapter which provides a leak-proof fit for connecting flexible tubing.

(c) Cellulose ester (membrane) filters, 37mm in diameter and 0.8 micrometer (um) in pore size.

(d) Cellulose filter support pads, 37mm in diameter when required.

(e) A sufficient length of flexible polyethylene tubing as necessary, with a minimum wall thickness of 1.6mm and an inner diameter which provides a leak-proof connection to the filter holder and portable pump adapter.

(2) Analysis Equipment

(a) An optical microscope with the following features:

(i) a binocular head;

(ii) 10x Huygenian or equivalent eye piece;

(iii) illumination with adjustable intensity;

(iv) Patterson Globe and Circle reticle

(v) a mechanical stage;

(vi) a phase contrast condenser with a numerical aperture; equal to or greater than that of the objective;

(vii) 40-45x phase contrast acromatic objective with a numerical aperture between 0.65 and 0.75.

(viii) a phase ring centering telescope or Bertrand lens;

(ix) a stage micrometer with 0.01 mm subdivisions.

(b) Glass microscope slides having 2.5 x 7.5cm dimensions with one end frosted.

(c) Coverslips for covering the filter on the microscope slide (2.2 x 3cm size and about 0.17 mm thick).

(d) Scalpel for cutting wedge-shaped portions from the filter.

(e) Fine-tipped tweezers for handling the filter.

(f) Solution for preparation of the sample made by mixing dimethylphthalate with diethyloxalate in the ratio of one to one by volume. To this solution 0.05 grams of cellulose ester filter per milliliter should be added and thoroughly mixed to make a solution with a refractive index of approximately 1.47. The solution should be discarded after 3 months and then a fresh solution should be made. The reagents used should be reagent grade, free of particles and colour and conform to the specifications of the American Chemical Society Committee on Analytical Reagents.

3. Sampling Procedure

(1) Preparation of Pumps

(a) The pump battery pack should be fully charged before use in any workshift. If more than one shift is being sampled, fully charged batteries should be substituted for the discharged ones.

(b) Flow meters, volume meters or constant flow devices on the pumps must be calibrated at 2.0 litres per minute (lpm) by using a primary standard such as a bubble meter or spirometer by the procedure recommended in the instructions for using the primary standard apparatus, with a representative filter holder and membrane filter in line.

(i) after not more than 40 hours of operation; checked after each shift.

(ii) after receiving unusually harsh or potentially damaging treatment.

(iii) after being disassembled for maintenance.

(2) Preparation of Filter Holders

(a) Assemble the filter holders in a clean environment prior to the initation of sampling.

(b) Prepare each filter holder by the following procedure:

(i) Use only clean filter holders and handle the support pad and filter with tweezers. Place a filter support when necessary and a cellulose ester filter in the base of the holder;

(ii) assemble the holder and seal the outlet and inlet ports;

(iii) ensure that the joints of the filter holder are sealed;

(iv) identify the sample by labelling the holder with an appropriate sample number.

(3) Sampling

(a) Assemble the sampling train by fixing one end of the flexible tubing to the inlet port of the pump and the other end to the adapter on the outlet port of the filter holder.

(b) Check for air leaks in the sampling train by turning on the pump and sealing the inlet port of the holder. The flow indicator on pumps with flow or volume meters should drop to the zero position and oscillate slightly; on pumps with constant flow devices, however, the pumping speed should increase to a maximum. If this does not occur, find the faulty component and either repair the air leak if possible, or replace the component.

(c) Attach the pump to the worker's belt or place it in his pocket, draw the flexible tubing over the shoulder and fix the holder as near as possible to the breathing zone, ensuring that the face of the holder is pointing downward. The equipment should be fitted so as to interfere as little as possible with work.

(d) Check that all equipment is properly assembled, remove the face portion of the holder, so that open-faced sampling can be performed and switich on the pump. Allow the flow rate to stabilize, then adjust the rate to 2 liters per minute. Pumps with constant flow devices should not be reset after the flow rate control mechanism has been adjusted to deliver air at 2.0 lpm, by comparison with a primary standard method.

(e) Note the following information for each sample:

(i) Name of worker;
(ii) Job title
(iii) Clock number of worker
(iv) Model and serial number of the pump;
(v) Date of sampling;
(vi) Company name;
(vii) Equipment calibration date;
(viii) Sample number on the filter holder
(ix) Air flow rate at initiation of sampling;
(x) Time of initiation and termination of sampling.

(f) Ensure that for sampling performed during any particular survey, two blank filters are prepared in the same manner as the sampling filters. These filters should remain in sealed holders during the sampling. Label these as blanks and send along with samples for analysis.

(g) To estimate the proper sampling times, for statistically reliable fiber counts, considerations should be given to microscope count field area, pump flow rate, average expected airborne fiber concentrations, counting rule range of 20 to 100 fields, adequate fiber density to yield a minimum count of 0.1 fiber per field and background airborne particulate level (Ref. NIOSH Manual of Analytical Method, Vol. 1, page 239-1). An optimum fiber density of about 1 to 5 fibres per field is recommended to minimize the counting errors. In order to get an idea of airborne fiber levels in a workplace, it is suggested that long and short interval samples should be taken. In this way, if long interval samples are too populated with fibers to count, the short interval ones can be used to calculate the actual fiber concentration.

The following formula may be used to estimate the minimum sampling time:

$$\text{Sampling time } (t) = \frac{f.A}{F.a.C.\ 1000} \text{ minutes}$$

where
- f = number of fibers/field, desired
- A = effective collecting area of filter, mm^2
- a = microscope field area, mm^2
- C = fiber concentration, $fibers/cm^3$
- F = flow rate of the sampling pump, litres per minute

(i) For monitoring the 8 hour workday or 40 hour workweek, TWA Standard,attempt should be made to sample at least 75% of the workday or workweek.

(ii) For monitoring the ceiling standard, several samples, each of 15 minutes maximum duration, should be taken during the expected periods of peak airborne asbestos concentrations.

During the sampling interval, the equipment should be checked periodically to ensure that it is functioning properly. The pump rotameter should be observed frequently and readjusted as needed. If unable to readjust, terminate sampling and start taking another sample using a pump containing fully charged bettery pack.

The air temperature and pressure in the sampling area may be recorded if flow rate corrections are required for the pump used for air sampling.

To terminate sampling for each filter used, perform the following procedures:

(i) record the air flow rate used for sampling;

(ii) record the time of termination;

(iii) stop the pump and carefully remove the equipment from the worker;

(iv) remove the filter holder, replace the face portion of the holder and seal the inlet and outlet ports;

(v) pack the filter holders into a rigid container with sufficient soft packing material to prevent crushing and transference of vibrations to the filter during transport to the laboratory.

4. ANALYSIS PROCEDURE

(1) Calibration of the Area of the Microscope Field of View

(a) The Paterson reticle cannot be used for counting until it has been calibrated with a stage micrometer. Each combination of eye piece and objective used with the reticle must be claibrated at least once:

(i) when the microscope is first received;

(ii) when new objectives or eye peices are installed;

(iii) after the microscope received a major servicing.

(b) Follow the procedure outlined here to perform a proper calibration of the area of the reticle:

(i) With a 10X objective in the microscope, place the stage micrometer on the mechanical stage, focus on the millimeter scale and center the image.

(ii) Change to the 40X objective and adjust the first millimeter scale division to coincide with the left boundary of the Patterson Globe and Circle reticle.

(iii) Read the micrometer position best coinciding with the right boundary of the reticle. Estimate any portion of the final division. This measurement represents the length (L) of the reticle.

(iv) Give a 90° rotation to the eyepiece (with reticle) and adjust the first millimeter scale division to coincide with the left boundary of the Patterson reticle.

(v) Read the micrometer position best coinciding with the right boundary of the reticle. Estimate any portion of the final division. This measurement represents the width (W) of the reticile.

(vi) Calculate the area (a) of the reticle,

$$a = L.W. \quad mm^2$$

(vii) Calculate the circle diameters. The #25 circle diameter is 0.1x(reticle length). The circle diameters are proportional to the ratio of their numbers. Thus the #20 circle diameter is 20/25 or 0.8 times the #25 circle diameter.

EXAMPLE: If length = 0.112 mm and width = 0.051 mm
Microscope Field Area = 0.112 x 0.051 = $0.0057 mm^2$

CIRCLE NO.	DIAMETER (μm)
25	11.2
20	8.95
15	6.72
12.5	5.60
10	4.48
—	—
—	—
—	—
—	—
—	—

(2) Preparation of Slides:

(a) Perform all work in a clean environment. Clean the slides, cover the slips and all tools with lens tissue and lay slides on a clean surface with frosted end facing upward.

(b) Label the frosted glass part of the slide with the same sample number as the filter holder containing the exposed filter.

(c) Using a glass rod, stir the mounting solution vigorously to ensure hemogeneity, apply a drop to the center of the slide and spread this solution into the approximate shape and size of the wedge cut from the exposed filter.

(d) Disassemble the holder to expose the filter and make two cuts from the center of the filter to the perimeter. The wedge cut should be approximately one-eighth of the total surface of the filter.

(e) Transfer the wedge to the solution on the slide, exposed side facing upward, with clean tweezers.

(f) Carefully place a cover slip over the wedge. Do not press or reposition the cover slip once contact with the solution has been made.

(g) Slides should be left for at least one hour after preparation, before the counting can begin, but if counting has not commenced within 48 hours, the slide should be discarded.

(3) Counting of Fibers on the Slides*

(a) Position the slide on the mechanical stage with the centre of the wedge under the objective lens and focus on the sample.

(b) Move the slide to a position near one side of the wedge and select a random field of view, ie. the area of the reticle, by looking away from the microscope and advancing the slide in one direction with the mechanical stage control.

---

*NOTE: - Where a mixed exposure occurs due to different forms of asbestos or asbestos and other fibrous material, samples should be analysed by electron diffraction method to determine the percentage of each asbestos component.

(c) Use the fine focus adjustment to scan different focal planes of the filter surface to obtain an accurate count in each field of view.

(d) Use the following criteria for counting of fibers for each field of view:

(i) avoid counting fields on the edge of the filter:

(ii) if a mass of material covers a significant portion of the field of view, reject the field and select a new one. Do not use the discarded field in the calculation;

(iii) if the filter is too heavily loaded with fibers, ie., more than twenty-five fibers are present in each field of view, then do not count this filter and use only the lower time interval samples, if possible to obtain estimates of the fiber concentration;

(iv) count only fibers with an aspect ratio of 3:1 or greater, with a length greater than 5μm;use the calibrated circles of the reticle to measure the length of fibers; measure curved fibers along the curve to estimate the total length.

(v) count fibers positioned entirely within the borders of the field of view as one fiber;

(vi) count fibers with one end outside the field of view as half a fiber and do not count fibers with both ends outside the field;

(vii) bundles of fibers are counted as one fiber unless both ends of the bundle can be clearly resolved.

(e) Record the total number of fibers in each field of view.

(f) Select a new field of view by repeating part (b); when the opposite side of the filter has been reached, advance the other directional control of the mechanical stage and follow a path roughly parallel with the first series of fields selected. Following this zig-zag pattern will ensure that a maximum area of filter is covered.

(g) Stop counting only if a minimum of 20 fields containing 100 or more fibers have been counted, or if a total of 100 fields have been counted.

(4) Quality Control on Counting and Preparation

(a) Count the blank filters first; if these blanks contain more than 3 fibers in 50 fields of view, the entire sampling procedure should be examined for sources of contamination and the sampling be repeated.

(b) One sample in every twenty or one sample per batch, whichever is the least, selected at random, should be recounted by the same counter. If the percent difference between the two counts is greater than 30%, then two additional samples from the batch must be recounted. If these two also exhibit a variation greater than 30%, then all samples in the group of 20 or the batch must be recounted, and the mean results of the two separate counts must be reported for this group of samples. (Note: If the difference is greater than 60% on these samples, then the sampling must be repeated).

(c) One sample in every twenty or one sample per batch, whichever is the least, (i.e. not the same sample as selected for recounting), selected at random, should be reprepared from a freshly cut section of filter and recounted by the same counter. If the difference between the two counts is greater than 50% then two additional samples from the batch must be recounted. If these two also exhibit a difference greater than 50%, then all samples in the group of 20 or the batch must be recounted, and mean results of the two separate counts must be reported for this group of samples. (Note: If the difference is greater than 90% on these samples, then the sampling must be repeated).

(5) Calculation of Results

Results of mean fiber count per field of view can be converted to concentration of asbestos fibers in the sampled air by using the following equation:

$$X = \frac{855 \cdot (A-B)}{1000 \cdot T \cdot F \cdot a}$$

where X = the airborne fiber concentration in units of fibers per cubic centimeter

A = the total number of fibers counted per wedge divided by the total number of fields of view observed on the exposed filter.

B = the mean of the total number of fibers counted per wedge on the blank filters divided by the total number of fields of view observed

855 = the collecting area of the filter for a 37mm diameter filter with an effective diameter of 33mm in mm^2

1000 = the factor for converting liters to cubic centimeters

T = the time of the sampling interval in minutes

F = flow rate of the sampling pump , litres per minute

a = the area of the field of view of the microscope in mm^2

Note: Calculate the correct volume of air sampled, applying pressure temperature corrections, if necessary.

(6) The proportion of workers to be selected for personal air sampling should be not less than the following:

Number of Workers Employed in Work Place	Proportion of Workers to be Selected
1-4	All workers
5-20	4 plus 50% of the number of workers over 4.
21-100	12 plus 25% of the number of workers over 20.
over 100	32 plus 5% of the number of workers over 100.

Notwithstanding subsection (6), sufficient personal samples should be taken which are representative of all operations and be taken on an ongoing basis to determine the TWA concentrations of asbestos at intervals not less than 3 months or as specified in writing by the Director, Occupational Health Branch.

APPENDIX 6.

COMPANIES USING ASBESTOS AND UNDER MEDICAL SURVEILLANCE BY THE OCCUPATIONAL HEALTH BRANCH (UPDATED SEPTEMBER 22, 1980)

	Name of Company	Location	No. of Employees Exposed
	ZONE 1		
1.	Abex Industries	Lindsay	134
2.	Balselite Thermosets	Belleville	20
3.	Branson Machine & Tool	Peterborough	10
4.	Canada Talc Ind. Ltd.	Madoc	26
5.	Canadian General Electric	Peterborough	150
6.	Dayton Tire	Whitby	86
7.	Durabla Canada	Belleville	11
8.	J.N.C. Limited	Ajax	41
9.	Ontario Gypsum Limited	Ajax	5
10.	Pennkote Limited	Ajax	3
11.	Raybestos Manhattan	Peterborough	126
12.	Reichold Chemicals	Lindsay	6
13.	Scott Laboratories	Pickering	10
14.	Trent Rubber	Lindsay	143
	ZONE 2		
1.	Alcan Canada	Kingston	2
2.	Applied Insulation	Kingston	2
3.	Asbestonos Corp. Ltd.	Ottawa	6
4.	Genstar Chemical	Brockville	13
5.	Dupont of Canada	Maitland	19
6.	Industrial Moulders	Jasper	7
7.	Kingston Psychiatric Hosp.	Kingston	4
8.	Ontario Hydro	Ralphton	7
9.	Ottawa Perma-Coating	Ottawa	4
10.	Sadler, James & Son Canada Ltd.	Ingleside	15
	ZONE 3		
1.	Abitibi Paper Co. Ltd.	Iroquois Falls	75
2.	Alcan Canada Products	Bracebridge	22
3.	Algoma Control Railway	Sault Ste. Marie	200

Name of Company	Location	No. of Employees Exposed
ZONE 3		
4. Algoma Central Railway	Hawk Junction	40
5. Algoma Steel	Sault Ste. Marie	2,500
6. Canadian Johns Manville	North Bay	7 Exasbestos Workers
7. Rufel Marble Products	Sault Ste. Marie	1
ZONE 4		
1. All Colour Paint & Chemicals	Oakville	6
2. Babcock and Wilcox	Burlington	16
3. Blast-Teck Limited	Oakville	7
4. Canadian Ferro Hot Tops	Stoney Creek	27
5. Canadian Meter Co. Ltd.	Milton	22
6. A.W. Chesterton Company	Burlington	2
7. Crane Packing	Stoney Creek	16
8. Currie Products	Hamilton	9
9. Dofasco	Hamilton	200
10. Endur Environment	Burlington	8
11. Hamilton Match Plate	Hamilten	7
12. Inmont Presstite	Georgetown	7
13. Kaiser Refractories	Oakville	37
14. Master Paint & Varnish	Hamilton	2
15. Niagara Paint & Chemical	Hamilton	6
16. Plastics & Asbestos Products	Hamilton	14
17. Plibrico Canada	Burlington	39
18. Provincial Brake & Clutch Service Ltd.	Hamilton	2
19. Rheem Canada Limited	Hamilton	30 Exasbestos Workers
20. Robert Soper Limited	Chatham	11
21. Thompson-Gordon	Hamilton	15
22. Westinghouse Canada Ltd.	Hamilton	20
ZONE 5		
1. Canadian Cylinder	Brantford	19
2. Canadian Gasket	Fort Erie	50

Name of Company		Location	No. of Employees Exposed
	ZONE 5		
3.	Canadian Gypsum	Hagersville	294
4.	Cataract Canvas Limited	Niagara Falls	22
5.	Domtar Construction	Brantford	70
6.	Domtar Construction	Caledonia	190
7.	General Motors of Canada	St. Catharines	1,780
8.	Hamilton Porcelains Ltd.	Brantford	79
9.	Harding Carpet Limited	Brantford	40
10.	Kirkwood Commutators Canada	Brantford	39
11.	Mott Manufacturing	Brantford	19
12.	Niagara Protective Coatings	Niagara Falls	9
13.	North American Refractories	Caledonia	12
14.	Ontario Hydro	Nanticoke	
15.	Pratt and Lambert	Fort Erie	36
16.	Scarfe and Co. (Inmont Canada Ltd.)	Brantford	13
17.	Sterling Varnish	St. Catharines	40
	ZONE 6		
1.	Able Gasket	Weston	16
2.	Acro Gasket Ind.	Rexdale	23
3.	Albion A.A.P. Inc.	Toronto	10
4.	Aluminum Goods (Alcan)	Toronto	54
5.	Amalgamated Electric	Markham	6
6.	Apco Industries	Toronto	6
7.	Asbestos Building Supplies	Toronto	10
8.	Asbestonos Corporation	Toronto	8
9.	Benjamin Moore & Co. Ltd.	Toronto	50
10.	Bondex International	Bramalea	4
11.	C.I.L. Paints	Concord	89
12.	Canada Colours & Chemicals Ltd.	Brampton	11
13.	Canada Varnish (CVI Paints)	Toronto	15
14.	Canadian Asbestos Ontario	Toronto	9 Exasbestos Workers
15.	Canadian Coleman	Etobicoke	39
16.	Canadian General Electric	Toronto	190

	Name of Company	Location	No. of Employees Exposed
	ZONE 6		
17.	Canadian Gypsum Co. Ltd.	Toronto	60
18.	Canadian Industries	Toronto	36
19.	Canadian Johns Manville	Toronto	
20.	Canadian Johns Manville	West Hill	500
21.	Canadian Rockwell Co. Ltd.	Toronto	22
22.	Cantire Products Limited	Toronto	78
23.	Central Precision	Rexdale	20
24.	Chembond Limited	Mississauga	13
25.	Chevron Asphalt	Toronto	8
26.	Childers Products Co. Ltd.	Mississauga	3
27.	Crupi, D and Sons Ltd.	Agincourt	5
28.	Colour Your World Inc.	Toronto	8
29.	Crouse-Hinds Canada Ltd.	Scarborough	72
30.	Crowle Fittings Limited	Brampton	3
31.	Desota Coatings	Toronto	17
32.	Downs Wood Limited	Toronto	17
33.	Dupli-Color (Canada) Ltd.	Scarborough	23
34.	Electrolyser Corp.	Etobicoke	38
35.	Erico Inc.	Toronto	10
36.	Flintkote Co.	Toronto	105
37.	Fuller H.B. Canada Inc.	Mississauga	2
38.	Garlock of Canada	Toronto	50
39.	Gibson-Holmans	Toronto	9
40.	Goodyear Canada Inc.	Toronto	136
41.	Gulf Canada Products	Mississauga	9
42.	Hemispheres International	Downsview	55
43.	House of Sturgeon (Chemicals Ltd.)	Weston	11
44.	IBIS Products Ltd.	Scarborough	13
45.	Industrial Coating Co.	Weston	5
46.	K.G. Packaging	Concord	11
47.	Knecht Berchtold Limited	Brampton	19
48.	Lee Chemicals	Toronto	1
49.	LePage's Limited	Bramalea	129
50.	Lever Detergents	Toronto	11
51.	Liquid Carbonic Canada Ltd.	Scarborough	110

Name of Company	Location	No. of Employees Exposed
ZONE 6		
52. Markham Sand & Gravel Ltd.	Buttonville	4
53. Masse Manufacturing	Toronto	2
54. Miller Paving	Toronto	3
55. M.S.A. Canada	Downsview	22
56. Mintex Canada Ltd.	Rexdale	83
57. Mobil Chemical Canada Ltd.	West Hill	83
58. Monleith, A.R. (77) Ltd.	Mississauga	14
59. National Health & Welfare (re Toronto International Airport)	Toronto	18
60. North York Board of Ed.	Willowdale	35
61. Ontario Hydro	Toronto	60
62. Ontario Hydro	Port Credit	110
63. Ontario Reman	Rexdale	3
64. P.P.G. Industries Canada Ltd.	Mississauga	80
65. P.P.G. Industries Canada Ltd.	Toronto	130
66. P.R.C. Chemical Corp. of Canada Ltd.	Weston	25
67. Parr Industries Limited	Weston	11
68. Para Paints Limited	Rexdale	42
69. Pattern Matchplate Inc.	Downsview	8
70. Professional Texture System Inc.	Markham	8
71. Repac Const. & Materials	West Hill	5
72. Royal Industries (Certified Brakes LSI Industries)	Rexdale	316
73. Safeco Manufacturing Ltd.	Scarborough	16
74. Seiberling Canada Ltd.	Toronto	300
75. Selectone Paints Ltd.	Weston	35
76. Sommerville Belkin Industries Ltd.	Scarborough	72
77. Swingline of Canada Ltd.	Toronto	4
78. Tempo Paint & Varnish Co.	Weston	12
79. Texas Refinery Corp. of Canada Ltd.	Toronto	4
80. Toronto Hydro	Toronto	60
81. Tremco Canada Ltd.	Toronto	120

Name of Company		Location	No. of Employees Exposed
	ZONE 6		
82.	Trend Coatings Ltd.	Weston	14
83.	Universal Sealants Ltd.	Toronto	2
84.	Viceroy Manufacturing Co. Ltd.	Toronto	180
85.	S.K. Wellman of Canada Ltd.	Concord	10
86.	D.A. White Co. Ltd.	Toronto	2
87.	Wilkinson Foundry Facing and Supply Ltd.	Toronto	22
	ZONE 7		
1.	Collingwood Shipyards	Collingwood	25
2.	Nor-Var Paints	Owen Sound	3
3.	Ontario Hydro	Tiverton	114
4.	P.P.G. Industries Canada Ltd.	Owen Sound	15
	ZONE 8		
1.	Almatex Limited	London	114
2.	Cleaver Brooks	Stratford	5
3.	Durametallic of Canada Ltd.	St. Thomas	23
4.	Firestone Textile Company	Woodstock	25
5.	Hayes Dana Parts Co. Ltd.	St. Thomas	33
6.	Ingersoll Machine & Tool Co. Ltd.	Ingersoll	120
7.	Ranger Safety Products Ltd.	Simcoe	34
8.	Richard Wilcox of Canada Ltd.	London	273
9.	Tobac Curing Systems	Simcoe	2
	ZONE 9		
1.	Bendix Corp. of Canada Ltd.	Windsor	480
2.	Byer's Truck & Trailer Equipment Ltd.	Windsor	2
3.	Holmes Insulation	Sarnia	23
4.	Inmont Canada Ltd.	Windsor	57
5.	James & Carter Automotive	Sarnia	12
6.	Ontario Hydro	Courtright	78
7.	Southern Wood Products Ltd.	Petrolia	33
8.	Welles Corporation	Windsor	75

	Name of Company	Location	No. of Employees Exposed
	ZONE 10		
1.	Clare Brothers	Cambridge	5
2.	Foseco Canada Limited	Guelph	34
3.	Franklin Manufacturing	Cambridge	13
4.	B.F. Goodrich Co. Canada Ltd.	Kitchener	194
5.	H.D. Pattern & Matchplates Inc.	New Hamburg	7
6.	Kovzite Industries Ltd.	Guelph	12
7.	Pirelli Cables Ltd.	Guelph	3
8.	Relmech Mfg. Limited	Elmira	38
9.	Silcofab Ltd.	Guelph	52
10.	St. Jacobs Canning	St. Jacobs	8
11.	Tracon Engineering Ltd.	Waterloo	16
12.	Uniroyal Chemical Division of Uniroyal Limited	Elmira	217
13.	Walker Exhausts Limited	Cambridge	66

APPENDIX 7.

Ontario
Ministry of
Labour

Occupational
Health and Safety
Division

Occupational
Health Branch

38

Minimum Recommendations for Occupational (Employee) Health Services

March, 1980

MINIMUM RECOMMENDATIONS FOR OCCUPATIONAL (EMPLOYEE) HEALTH SERVICES

1. That policies covering the occupational health program be developed early and based on the principles contained in the Canadian Medical Association pamphlet, "Guiding Principles for the Provision of Occupational Health Services."

2. That the health program include environmental health protection, and that manuals on toxic chemicals and physical agents be available.

3. That the health program should cover both full-time and part-time staff at every level (from the labourer to the chief executive.)

4. That the health unit(s) plan be developed based on the following minimum recommendations:

   (a) Space

   Functional layout be developed to include a minimum of a reception/waiting area, treatment room, a recovery room, a doctor's office and/or nurse's office, a lavoratory and storage cupboard (unit serving 600). Larger/main health service unit should include other facilities such as a laboratory, staff/change/locker room, more physician and nurses office space, clerical office, etc..

LARGE: 1 sq. foot/employee for first 1,000

½ sq. foot/employee for second 1,000

¼ sq. foot/employee over 2,000

SMALL: Scaled down for number of employees served.

   (b) Equipment and Supplies

   That they be adequate to:

   (i) cover emergency care and rehabilitation of the employee returning to work after an accident or illness

   (ii) provide surveillance of potential plant health hazards and a record system to evaluate and control such hazards

(b) Equipment and Supplies - continued

(iii) maintain confidential medical record system to provide a health profile of the employees

(iv) provide emergency (first aid) kits and stretchers for on the spot care in strategic locations within the plant

(c) Staffing Pattern

(i) Medical

1½ hours/week/100 employees

(ii) Nursing

2 hours/day/100 employees

unit requiring 6 hours/day should be staffed with 1 full-time nurse

(iii) Clerical

clerical assistance, part-time or full-time dependent on number served by unit

(iv) Technician (large service)

full-time technician for in-plant testing and laboratory procedures

(d) Stocking Pattern for Drugs and Supplies

(i) Central storage in the main health unit with distribution to smaller centres

(ii) Small service

Drugs and supplies should be purchased in quantity related to economy, stability and the storage space available in the health centre unit

5. BUDGET:

(a) that capital budget be established to cover space, furnishings, equipment, drugs and supplies to initiate the program

(b) that the operational budget be based on projected cost per employee per year (minimum $25/employee)

SUPPORTING MATERIAL:

(1) First Aid Regulations, Workmen's Compensation Act

(2) Guiding Principles for the Provision of Occupational Health Services, C.M.A.

(3) Records for Occupational Health Services, O.H.S.

(4) Morbidity Records and Statistics for Industry, O.H.S.

OCCUPATIONAL HEALTH BRANCH
MINISTRY OF LABOUR
MARCH, 1980

APPENDIX 8.

G.H. KOCH, M.D.
April 27, 1978

ASBESTOS AS A CARCINOGEN IN MAN

INTRODUCTION:

The causal relationship between the inhalation of asbestos fibres and the development of disease in man is well documented and will not be reviewed here. The risk of developing a given disease after occupational or non-occupational exposures to specific types and concentrations of asbestos fibres has not been well demonstrated. In order to study and quantify this risk, the literature has been reviewed and four main references (1-4) have been found. These are the sources for most of this outline. Other references will be cited as appropriate.

ASBESTOS:

Asbestos is the generic name for a class of natural hydrated fibrous silicates that have several unique properties. First and foremost is their fibrous nature. The mineral crystals are so structured that they form fibres (defined as a particle at least three times as long as it is wide) which can be woven. The fibres are heat stable to high temperatures, they have thermal and electrical insulating properties; they are stable in acid and alkali and they have hardness and tensile strength that can be exploited. These properties make asbestos commercially important.

Asbestos fibres have been used in increasing amounts since the late 19th century in more and more applications. World production more than doubled between 1960 and 1975 and is presently in excess of 5 x 10^6 metric tons. There are over 3,000 uses for the fibres and Table 1 gives an index of some of these.

Asbestos is found in two distinct mineral forms, serpentine and amphibole. There is only one fibrous form of serpentine, called <u>chrysotile</u>, which is mined primarily in Canada, Rhodesia and U.S.S.R. It accounts for over 90% of the world usage. There are three commercially important amphiboles which are practically indistinguishable physically and are chemically different only in their metal content. The three are called <u>crocidolite</u>, <u>amosite</u> and <u>anthophyllite</u>, but for this discussion we will consider them together as amphibole. They are not mined in Canada, though they are used in the Canadian asbestos product industry, especially crocidolite.

All commercially important forms of asbestos have been implicated in disease production and there is speculation that non-important varieties and asbestiform minerals that contaminate iron ore, gold ore and other ore bodies may produce disease as well.[1 pg.70-73]

Figures 1 and 2 show the physical and chemical differences between chrysotile and amphibole fibres. Chrysotile fibrils are tubular, with hollow centres or centres filled with hydrated magnesium silicate.[9] The fibrils form fibre bundles which tend to be curly, [redacted]. Amphiboles are larger fibres and are very straight. The cations, or metals found in amphiboles are iron, magnesium, aluminum, manganese, calcium and sodium.

The ability of asbestos to induce disease is related to the physical characteristics of the fibre, and chemical composition appears to be a minor factor. Harington,[9] in his review, discusses the potent cytotoxic and haemolytic effects of chrysotile; effects which are not or only weakly demonstrated by the amphiboles. The effect is due to the

magnesium ions in chrysolite, since the effect is lost when the magnesium is leached out, or when chelating agents are used. He cites this mechanism as partly responsible for cell damage or cell alteration that leads to disease in animals and man, but it does not account for the disease inducing effect of amphiboles, which is epidemiologically more prevalent (see below).

Oils and waxes which can be attached to asbestos fibres as contaminants have been cited as possible factors in carcinogenesis, but this has been conclusively ruled out in animal experiments where uncontaminated and contaminated asbestos samples produced neoplasms at equal rates.

The physical dimensions, length and diameter, of fibres most closely correlate to disease production and can be summarized as follows:

1. Fibres less than 200 µm (micrometers) in length may enter the lungs. Longer fibres are screened out in the nasopharynx. The degree of penetration into airways depends mainly on fibre diameter. Deposition in airways is by sedimentation and inertial impaction.

2. Fibres less than 3µm in diameter can attain the respiratory bronchioles and alveoli. Timbrell demonstrated that an asbestos fibres 3µm in diameter has the same falling speed as a 10µm sphere of unit density. The deposition of particles in airways is related to aerodynamic diameter as measured by falling speed. Most inhaled particles with falling speed greater than a 10µm sphere of unit density are deposited in upper airways by sedimentation or impaction. Measurements

made on fibres in lungs of city dwellers is in good agreement with this, as is measurement of fibres in lungs of rats exposed to airborne amphibole.

3. Long fibres, 5μm or greater are more fibrogenic, i.e. more likely to induce pulmonary fibrosis. Harington [9] cites a review of studies made by Vigliani, and lists a summary on page 183. In 7 studies five conclude long fibres are more fibrogenic. One study states short fibres produce slight fibrosis and another states short fibres are as "lethal" as long ones.

4. Fibre length does not correlate well with carcinogenic potential. This is difficult to determine exactly from the literature. Intrapleural injection of short fibres cause tumors in rats, but long fibres also cause tumors with lesser frequency. Inhalation experiments may mislead because shorter fibres tend to penetrate more peripherally in the lung, where more tumors are found. Very finely milled asbestos, producing extremely short fibres produced no tumors in rats,suggesting that a minimum length may exist.

5. Fibre diameter does correlate to carcinogenic potential. The narrower the fibre (less than 5μm) the greater the incidence of mesothelioma in rats (see table 2 - from (1))

6. Short fibres (less than 20μm in length) can migrate through tissues. This is demonstrated in rats exposed to airborne asbestos. Fibres appear in the pleura within hours after exposure.

ASBESTOS RELATED DISEASES:

ASBESTOSIS:

Asbestosis or asbestotic pneumoconiosis is a progressive, irreversible fibrosis of the lungs resulting from exposures to fairly high concentrations of asbestos dust. The disease has progressive morbidity as fibrosis increases and respiratory reserve is reduced. Clinical findings associated with the disease are fine râles, finger clubbing, shortness of breath, compromised pulmonary function studies and radiographic changes. In the past the final outcome was death due to respiratory insufficiency and cor pulmonale, but in recent years, due to improved industrial hygiene, the exposures are less, progression of the disease is more slow and the final outcome is often death due to neoplasms. In Canada, in 1973 there were 96 cases recorded by Workmen's Compensation Boards (23 in Ontario, 70 in Quebec) and in 1974, 111 cases (19 in Ontario, 85 in Quebec).[10]

The mechanism of fibrosis is thought to be related to destruction of pulmonary macrophages which ingest or attempt to ingest asbestos fibres. Chrysotile has been shown to be cytotoxic and this may account for macrophage destruction. How amphiboles, which are only weakly cytotoxic exert their effect is not known but it may relate to mechanical disruption of cellular membranes.

Fibrosis begins in the periphery and lower lobes and spreads centrally. This is consistent with findings of fibres in non-occupationally exposed city dwellers. The fibres are more numerous in the periphery.

Exposure periods in those who develop asbestosis are of the order of seven to twenty years. Dust concentration is a factor, and present occupational standards are designed to keep the incidence as low as technologically possible.

The British Occupational Hygiene Society reported that workers exposed to an estimated dust concentration of 112 fibres years/ml.would have a 1% chance of developing basal râles, and early sign of asbestosis. Assuming that no one would work longer than 50 years in an asbestos industry, the exposure level of 2 fibres/ml, as a time weighted average was proposed.

PLEURAL PLAQUES:

Calcified pleural plaques and thickened parietal pleural, radiologically evident, frequently occur in asbestos workers. The significance is not understood but is regarded as pathognomonic of asbestos-related disease by many, especially when multiple or bilateral. The finding is not related to disability and usually is rare until 20 years after first exposure.

CARCINOMA OF THE LUNG:

A number of epidemiological studies have shown that there is an excess of observed versus expected deaths due to carcinoma of the lung in workers exposed to asbestos in industry. Interestingly, a study by MacDonald et. al. of Quebec asbestos mining workers showed no such excess.

Selikoff and his co-workers studied 17,800 asbestos insulation workers and found 275 deaths due to carcinoma of the lung between 1967 and 1972, and excess mortality of 392%. Up to 1 June, 1977, in the same study, there have been 485 deaths due to carcinoma of the lung where 105.97 were expected. Other authors cite 1.7 to 12 fold increased risks of lung cancer.

There is a significant relationship to cigarette smoking. Non-smoking asbestos workers have a slight excess of carcinoma of the lung, whereas smoking asbestos workers have an 8 to 10 fold greater incidence than expected. The relationship between smoking and asbestos in inducing cancer is not understood but there is speculation that there is a synergistic effect between the two.

An interesting observation is that the cancer cell type distribution is not the same in asbestos exposed persons and smokers.[11] This is illustrated in Table 3.

TABLE 3

Lung cancer cell type related to smoking and asbestos exposure.

	Lung Cell type %		
Exposure	AD	EP	SM
Exposed to Asbestos (a)	30	56.5	13.5
(b)	18	43	39
Not exposed:			
Smokers	19	64	17
Non Smokers	75	19	6

(a and b are two different studies - no smoking data presented)

AD = Adenocarcinoma

EP = Combined adenosquamous, epidermoid and large cell.

SM = Small cell carcinoma.

In addition, in comparing 37 cancers found in asbestos exposed workers with 37 similar cancers found in non-exposed workers, the lung area affected was different.[11] In the asbestos exposed group 72% of the tumors were located in the lower and middle lobes compared with 33% in these locations in the non-exposed group. The asbestos associated tumors more frequently involved the pleura (14 vs 8) as well. Histological appearances were very similar in both groups.

There are however, so many variables involved in relation to carcinoma of the lung and asbestos exposure that it is hard to draw any definite conclusions other than exposure does lead to carcinoma and smoking raises the risk. It is not possible to define whether chrysotile or amphibole asbestos present any difference in risk. The difference in excess deaths in insulation workers where amphibole is used, and in Quebec asbestos miners exposed only to chrysotile, may cause one to suspect that amphibole fibres are more dangerous. If this is true then thinner fibres would be the more dangerous.

MESOTHELIOMA OF THE PLEURA:

This is a very rare malignancy which, if a careful search is made, has a very high correlation with asbestos exposure. Pooley of the U.K. showed that 92% of mesothelioma cases had lung tissue positive for asbestos fibres by electronmicroscopy. Some authors suggest that mesothelioma has no other cause.

Animal experiments show fairly conclusively that it is the short thin fibres that induce mesothelioma. This was initially expected based on studies of mesothelioma incidence in two mining areas of South Africa. In one area the incidence was much higher than the other. It was eventually demonstrated that the only difference between the two mines (and the workers) was that the one in which the incidence was higher,produced much shorter and narrower diameter fibres.

Upon inhalation, the fibres migrate to the pleura and are taken up by mesothelial cells of the pleura. By theoretical mechanism of physiochemical effects on cell membranes, in which the cells are not destroyed but altered and revert to a less differentiated form, the fibres induce neoplasia.

Mesothelioma has no relation to smoking, the incidence being the same in smoking and non-smoking asbestos workers. It occurs less frequently than carcinoma by a ratio of 1 mesothelioma to 5 or 6 carcinomas. In the Selikoff study of 17,800 asbestos insulation workers there were 66 deaths due to pleural mesothelioma by January 1977.

Accurate diagnosis of mesothelioma has been a problem. Diagnostic criteria are now established as a result of the work of Mesothelioma Panels operating under the auspices of the International Union Against Cancer (I.U.C.C). Because of diagnostic difficulties, some older tumor data may be of poor quality. It may be possible to review this data and the tissue to affirm diagnosis and to determine asbestos exposure.

The period between first diagnosis of mesothelioma and first exposure to asbestos is recorded as short as 16 years and as long as 40 years. Longer periods are more common. Once the diagnosis is made, the course is usually rapid, leading to fatal outcome in a year or less.

PERITONEAL MESOTHELIOMA:

This is a much rarer disease than pleural mesothelioma but is also thought to be asbestos induced. In the Selikoff study of 17,800 workers, there have been 109 deaths due to this disease upto 1977. Asbestos is theorized to migrate from the pleura or from the gut (as a result of ingestion) and induce neoplasia in the visceral peritoneum. However long term feeding experiments in animals have failed to produce tumors in significant numbers. Trans-gut migration is not clear cut due to the unique nature of gut endothelium. Fibres can be demonstrated in the endothelial cells, but are not found in very large numbers in the peritoneum. Therefore the mechanism of peritoneal mesothelioma induction is not at all clear.

OTHER NEOPLASMS:

Recently asbestos has been implicated in the production of laryngeal and gastrointestinal tumors. Epidemiological studies in the U.K. and U.S. have shown a slightly greater than expected number of gastrointestinal tumors in asbestos exposed workers. In studies of laryngeal cancer, of 100 men with squamous-cell carcinomas 31 had exposure to asbestos compared with only three in matched controls. Another study revealed two cases of cancer

of the larynx when the expected number was 0.4. The study involved 4,000 workers.

Because of the very few cases, this relationship may be due to technical error in the studies.

ASBESTOS BODIES:

Historically, these dumbell-shaped, protein covered bodies have been associated with asbestosis and asbestosis-related neoplasms. However, it has been shown that other fibres can cause the formation of these bodies and their association with asbestos alone is no longer valid, though many authors persist in using them to determine asbestos exposure.

The bodies are theoretically the result of macrophage reaction to asbestos or other types of fibres. Macrophages ingest the fibres and they are coated with a mucopolysaccharide matrix followed by a coat of hemosiderin. They are then presumably excreted by the macrophage or the cell dies, leaving the body behind. Asbestos bodies are very rarely found in tissues other than the lungs.

TISSUE RESPONSE TO ABSESTOS:

The above diseases and asbestos bodies are a result of tissue response or reaction to asbestos. The nature of this response is not determined, but there is speculation based on some of the evidence gathered. Chrysotile asbestos is cytotoxic and causes haemolysis. Silica, depending on type is similarly cytotoxic and haemolytic but with silica, the effect is thought due to hydrogen bonding effects on cellular membranes and due to the formation of the hydrogen donor Silicic acid.

With chrysotile the effect is due to magnesium, as cited above. The cytotoxic effect is of two types, an early reaction and a late reaction. The early reaction is accelerated by complement and is thought to be an interaction of chrysotile fibre's magnesium with plasma membranes creating large ionopores which allow change of osmotic equilibrium in the cells, resulting in swelling and rupture. The late effect is after the fibres have been phagocytosed [redacted] is are associated with release of lysosomal hydrolases. It is attributed to an interaction of ingested asbestos particles and lysosomal membranes.

Asbestos fibres shorter than 5µm in length are totally ingested by macrophages. Fibres longer than 20µm are not andsome bizarre effects can result.

It is not known how amphiboles exert their effects, whether through the metals, through- hydrogen bonding or other means.

AIRWAY DEPOSITION OF FIBRES:

Fibres longer than 200µm are filtered out in the naso-pharynx. Shorter fibres can penetrate the airways and may reach the respiratory bronchioles and alveoli. The degree of penetration of a fibre depends on its diameter (the free falling speed of a fibre is approximately proportional to the diameter squared), and the degree of turbulence in the airways.

In quiet breathing there is turbulence only in the upper airways on inspiration and theoretically, a long fibre can readily penetrate as far as alveoli. This is confirmed by necropsy studies.

Fibres may settle on (gravity sedimentation) or impact with airway epithelial cells at any point. In the upper airways, mucociliary activity will probably lead to substantial if not totally clearing of fibres,provided these mechanisms are intact and not compromised, as in smokers. The cleared fibres would be swallowed.

Fibres that penetrate beyond the mucociliary airways may be cleared by macrophage action, may migrate to other lung regions, may remain and induce disease or may be cleared by other mechanisms.

Exact airway deposition of fibres is not well defined and it may be required to derive a model for this process, particularly in relation to carcinoma of the lung.

ASBESTOS FIBRE DISTRIBUTION IN THE LUNG:

Amphibole asbestos fibres are not very soluble and are therefore generally retained in tissues in an unaltered state. They are also more commonly found at the core of asbestos bodies.

Chrysotile fibres tend to break up, or be broken up into submicroscopic fibres with diameters of the order of 30-40 nanometers (nm). They are in visiblein light microscopy. Magnesium, the metal constituent of chrysotile, is leached out of the fibres with long in-vivo residence.[5] This does not occur with amphiboles. Therefore chrysotile fibre dimensions are difficult to determine and the use of election microscopy of

tissue specimens is essential.

In general, fibres in lung tissue are less than 3μm in diameter and less than 100μm in length. Of the total asbestos inhaled into the lungs, only a small proportion is ultimately retained. Animal experiments (fig.3) show that amphibole asbestos burden increases with continued exposure, whereas chrysotile burden reaches a plateau quickly. After exposure ceases, the burden decreases. The clearance mechanisms are not well defined or understood.

Smaller asbestos fibres migrate through lung tissues, as demonstrated in animal inhalation experiments. Small fibres appear in the pleura within hours after exposure. The migration is not an "active transport" mechanism via cells, but simply physical, related to the size and shape of the fibres, which can be described as needle - like, and pendulum motion of lung tissue during respiration.

Post mortem examinations of humans reveal asbestos bodies and asbestos fibres in the lungs of both occupationally exposed and non-occupationally exposed persons. Fibres appear to be more heavily deposited in the upper lobes and the periphery. The Peripheral fibres tend to be shorter and thinner. Fibres of smaller dimensions may be present in larger numbers in the pleura. There is no established relationship between the number of asbestos bodies and asbestos fibres. Asbestos bodies cannot therefore be used as an index of exposure or degree of exposure to asbestos.

ASBESTOS IN THE GENERAL ENVIRONMENT:

Asbestos fibre concentrations in urban air are usually less than $10 ng/m^3$ but may be as high as $5000 ng/m^3$ near some factories using asbestos. In buildings sprayed with asbestos insulation, levels of 200 to 800 ng/m^3 are reported long after spraying.

Canadian tap water levels have been reported as 2 to 173×10^6 fibres/litre with the high levels from unfiltered tap water near mines.

Food concentrations have not been well investigated.

Beverage asbestos content appears to be limited to some alcoholic beverages which have been filtered with asbestos filters. 13 to 24×10^6 fibres/litre have been reported.

Pharmaceuticals have been found to contain up to 1,000 ng/g chrysotile.

Domestic asbestos exposures can occur from dust on workers clothing, hair, tools, etc. and from do-it-yourself construction.

Occupational exposures vary greatly depending on occupation. Occupational standards refer to fibres longer than 5μm, which are more fibrogenic. Shorter fibres, which may be more carcinogenic, could therefore be at high concentrations, but not monitored. These short fibres are also the fibres that are more likely to remain suspended in air for long periods. Long and therefore heavier fibres will precipitate out more rapidly, though fibre diameter is a factor. The standard will probably have to be reconsidered and related to a fibre size distribution matrix.

OCCUPATIONAL AND AMBIENT ASBESTOS FIBRE MEASUREMENT:

The measurement units for asbestos fibres in the environment and the sampling methods used present problems. Measurement units are:

- million parts per cubic foot (mppcf),
- fibres greater than 5μm in length per millilitre. (fibres >5μ/ml),
- million fibres per meter cubed (10^6fibres/m^3).
- nanograms per meter cubed (ng/m^3), or
- nanograms per litre (ng/l). Only one of these units

refers to fibre size, and only to long fibres. Diameter is not considered. There is very poor and difficult correlation between units, though it has been derived that 100 mppcf equals approximately 3,600 fibres/ml. (8) Total fibre weight relative to a given volume of air or water is a useful figure if it is accompanied by a matrix of fibre size distribution.

Samples are collected via filters or gravimetrically and fibres are counted or weighted. Counting is done with either phase contrast light microscopy or transmission electron micrscopy. The former requires an expert microscopist to interpret results. Fibres smaller than 0.36μm cannot be seen and up to 70% of particles may be missed. Definite identification of fibres as asbestos may also be difficult. In electron microscopy, all particles are detected and can be sized fairly accurately. Definite identification of asbestos type can also be made. However, the techniques of sample preparation may alter fibre size distribution.

The presence of asbestos in an unknown sample can be determined by infra-red spectroscopy (6).

Accurate determinations of asbestos fibre in tissues are done by examining tissue specimens or ashed samples and counting and sizing fibres on transmission electron microscope photos.

SUMMARY:

1. Exposure to asbestos fibres in occupational and non-occupational settings can lead to diseases. Diseases definitely attributable to asbestos inhalation are:

asbestosis

benign pleural plaques

carcinoma of the lung.

mesothelioma of the pleura.

Diseases less definitely attributable to asbestos exposure are peritoneal mesothelioma, carcinoma of the larynx and gastrointestinal carcinoma.

2. Longer fibres, greater than 5μm in length are more fibrogenic and present the greater risk of causing asbestosis. Occupational standards use this factor.

3. Small diameter fibres, less than 3μm in diameter though possibly even much narrower appear to be more tumorigenic.

4. The exact mechanism of disease induction is not understood, but asbestosis is theorized as a result of alveolar macrophage distruction by asbestos fibres. Neoplasia may be due to physiochemical effects on intracellular membranes causing alterations in cell activity resulting in abnormal growth.

5. The exposure period and period between first exposure and first evidence of disease are both variable and may be long. The interval period for asbestosis is the order of 7-20 years and for neoplasms 16-40 years.

6. Lung deposition, distribution and clearance data is sparce and is difficult to relate to either disease or occupational exposure levels at present. This problem needs clarification if a dose response function is ever to be derived.

REFERENCES

1. IARC Working Group,
IARC Monograph on the Evaluation of Carcinogenic Risk of Chemicals to Man:
ASBESTOS, Volume 14.
World Health Organization, International Agency for Research on Cancer, Lyon 1977.

2. Bogovski, P., Gilson, J.C., Timbrell, V., and Wagner, J.C. (editors).
Biological Effects of Asbestos: Proc. of a World Conf. Lyon, France, Oct. 1972.
IARC Scientific Publication #8,
World Health Organization. International Agency for Research on Cancer, Lyon 1973.

3. Shapiro, H.A., (editor).
Pneumoconiosis: Proc. of the International Conference. April-May 1969, Johannesburg.
Oxford University Press, Cape Town, 1970.

4. Kannenstein, M., Churg, J., McCaughey, W.T.E., & Selikoff, I.J.,
Pathogenic Effects of Asbestos.
Arch. Pathol. Lab. Med. 101: 623-628. Dec. 1977.

5. Langer, A.M., Baden, J., Hammond, E.C. & Selikoff, I.J.,
Inorganic Fibres, Including Chrysotile, In Lungs at Autopsy: Preliminary Report.
Walton, W.H. (editor)
Inhaled Articles III. Proc. of an International Symposium organized by the British Occup. Hyg. Soc. in London, Sept. 1970. Vol.I & II
Urwin Bros. Ltd. Surrey,England, 1971.

6. Coates, J.P.,
IR Analysis of toxic Dusts:
Analysis of collected samples of asbestos.
Am. Lab. 9 (13): 57-58, 60-65, 1977.

8 U.S. Govt, National Inst. for Occupational Safety & Health,
Occupational Exposure to Asbestos
U.S. Dept. of Health, Education & Welfare Report # HSM 72-10267, 1962, pg. III-21.

9. Harington, J.S.,
The Biological Effects of Mineral Fibres, especially Asbestos, as seen from in vitro and in vivo studies.
Ann.Anat.Pathol. 21: 155-198, 1976.

REFERENCES

10. Schreiber, G., Smith, J.H., Evinton, L., & Bergeron, P., Report of the Asbestosis Working Group. Environmental Health Directorate, Dept. of National Health & Welfare, Ottawa, 1976.

11. Churg, J., & Kannenstein, M., Occupational Exposure and its Relation to type of Lung Cancer, in Nettestein, P., Harma, Jr. M.G., & Deatherage Jr.J.W. Morphology of Experimental Respiratory Carcinogenesis, US Atomic Energy Commission, Division of Technical Information, Oakridge, Tennessee, Dec. 1970.

TABLE 1

ASBESTOS END USE

USE	AMOUNT (10^6 Kg) U.S.A. 1974	AMOUNT (10^6 Kg) Canada 1973
Asbestos Cement Pipe	202	20.7
Asbestos Cement Sheets	86	4.5
Flooring Products	139	18.9
Roofing Products	67	) 16.2
Paper	57	)
Packing and Gaskets	26	1.8
Thermal Insulation	8	) 1.8
Electrical Insulation	4	)
Friction Products	72	5.4
Coatings and Compounds	34	-
Plastics	16	-
Textiles	18	5.0
Other	34	-

Table 2

Percentage of rats developing mesothelioma after intrapleural administration of various materials.

Material	% of rats with Mesotheliomias
SFA chrysotile (Superfine Canadian)	66
U.I.C.C. crocidolite	61
U.I.C.C. amosite	36
U.I.C.C. anthophyllite	34
U.I.C.C. chrysotile (Canadian)	30
U.I.C.C. chrysotile (Rhodesian)	19
Fine glass fibre (code 100) mediandiameter 0.12μm	12
Ceramic fibre, diameter 0.5-1 μm.	10
Glass powder	3
Coarse glass fibre (code 110) mediandiameter 1.8μm	0

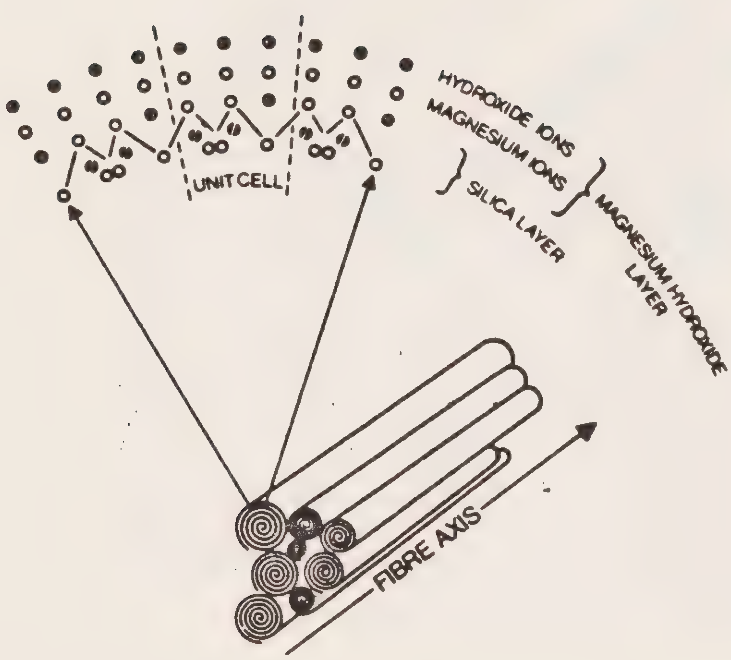


Fig. 1 Schematic diagram of the structure of a chrysotile fibre formed of several scrolls of individual crystallites. Each scroll is formed from a closely connected double layer having magnesium hydroxide units on its external face and silica units on its inner face. The details of a small section of the scroll show the structure of the double layer and of the unit cell based on $Mg_3(Si_2O_5)(OH)_4$.

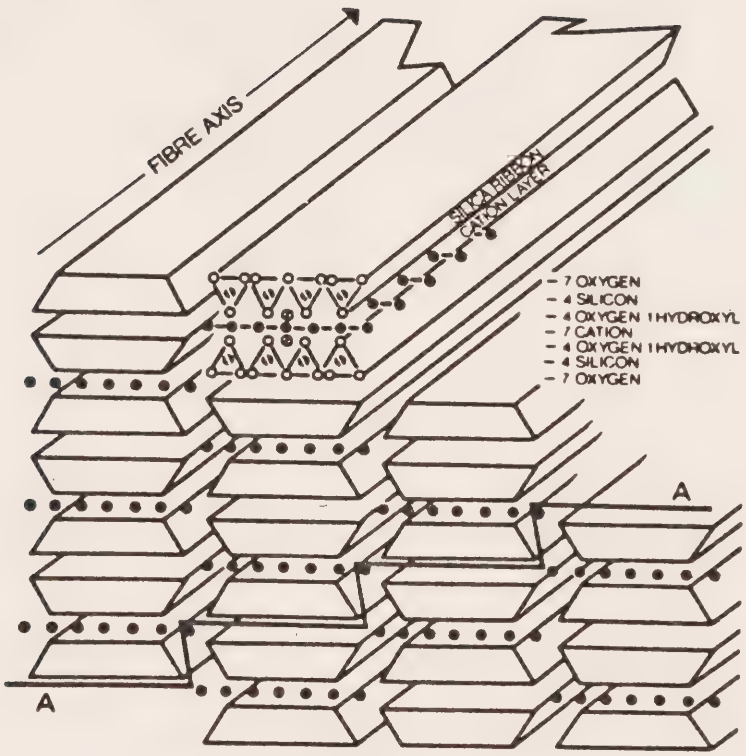


Fig. 2 Schematic diagram of the crystal structure of an amphibole fibre, indicating the unit cell based on $X_7Si_8O_{22}(OH)_2$. The line A-A represents the edge of the preferred cleavage plane along which the fibres will split to form even smaller fibres.

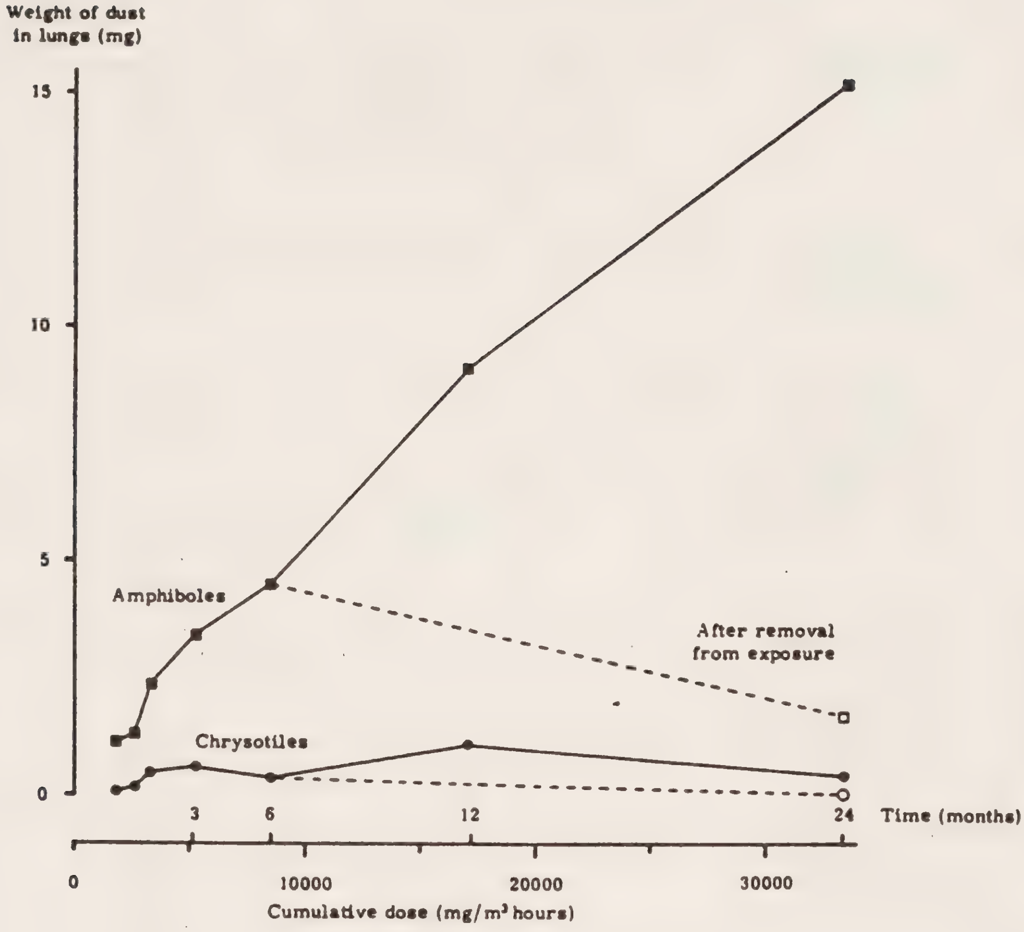


Fig. 3 Effects of Inhalation of
Asbestos in Rats.

Summary of most relevant animal experiments

Reference	Findings	Animal species	Dosage	Type of fibre
A. ORAL				
Gibel *et al.*, 1976	With asbestos filter material, 12/42 animals with malignant tumours (4 kidney carcinomas, 1 lung carcinoma, 3 reticulum-cell sarcomas, 4 liver-cell carcinomas) With talc, 3/45 rats with liver-cell carcinomas 2 liver-cell carcinomas in 49 controls	Groups of 50 Wistar rats	50 mg/kg bw/day administered in the diet for life	Asbestos filter material containing 52.6% chrysotile, talc
Wagner *et al.*, 1977a	2 gastric leiomyosarcomas, 1 in a rat fed chrysotile and 1 in a rat fed talc None in controls	Groups of 32 Wistar rats	100 mg/day on 5 days/week for 100 days over a 6-month period	Chrysotile, talc
B. INHALATION				
Lynch *et al.*, 1957	Pulmonary adenomas in 46% (58/127) of chrysotile-exposed group and in 36% (80/222) of controls	AC/F_1 hybrid mice	150-300 million particles/ml 8-12 hr/day on 5 days/week for 17 months	Chrysotile
Gross *et al.*, 1967	25/72 rats surviving 16 months or longer developed lung tumours (17 adenocarcinomas, 4 squamous-cell carcinomas, 7 fibrosarcomas) No such tumours in 39 controls	Rats	80 mg/m^3, 30 hrs/week	Chrysotile
Reeves *et al.*, 1971	2/31 rats developed carcinomas of the lung after crocidolite exposure 5/40 rats developed adenomatosis after chrysotile exposure	Rats	49 mg/m^3, 16 hrs/week for 2 years	Crocidolite, chrysotile, amosite
Reeves *et al.*, 1974	5 lung carcinomas with crocidolite, 2 lung carcinomas and 1 pleural mesothelioma with chrysotile and 2 pleural mesotheliomas with amosite	Groups of 69 Charles River CD rats	5 mg/m^3, 4 hrs/day on 4 days/week for 2 years	Crocidolite, chrysotile, amosite
Wagner *et al.*, 1974	Asbestosis produced with all types of fibres lung cancer / mesothelioma / fibre 11/146 / 1/146 / amosite 16/145 / 2/145 / anthophyllite 16/141 / 4/141 / crocidolite 17/137 / 4/137 / chrysotile (Canadian) 30/144 / 0/144 / chrysotile (Rhodesian)	CD Wistar rats	12 mg/m^3, 7 hrs/day on 5 days/week for 1 day, 3, 6, 12 or 24 months	5 UICC asbestos samples
Reeves, 1976	With crocidolite, 14% incidence of malignant tumours of the lung With chrysotile, 5% incidence of malignant tumours of the lung and mediastinum With amosite, 5% incidence of malignant tumours of the lung and pleura	Rats	50 mg/m^3, 4 hrs/day on 4 days/week for 2 years	Crocidolite, chrysotile, amosite
Wagner *et al.*, 1977a	1 adenocarcinoma of the lung with superfine chrysotile in 24 rats exposed for 12 months	CD Wistar rats	10.8 mg/m^3, 7.5 hrs/day on 5 days/week for 3, 6 or 12 months	Chrysotile

Summary of studies of carcinogenicity in human populations

Reference	Finding	Group and exposure
A. OCCUPATIONAL EXPOSURE		
Historical studies		
Lynch & Smith, 1935 Gloyne, 1935	Suspicion of association between asbestos and lung cancer	Asbestos workers
Wedler, 1943a,b Wyers, 1946 Weiss, 1953	Case reports of pleural and peritoneal tumours associated with asbestos	
Leicher, 1954	A peritoneal tumour	
Doll, 1955	Lung cancer	Asbestos textile workers employed before 1930
Wagner *et al.*, 1960	Mesotheliomas	Miners and non-mining population
Mancusco & Coulter, 1963	Lung cancer and mesothelioma	Asbestos workers
Selikoff *et al.*, 1964	Lung cancer and mesothelioma	Asbestos workers
Epidemiological studies		
Lung, pleura and peritoneum Mixed types of fibres		
Knox *et al.*, 1968		Asbestos textile workers employed after 1933
Newhouse, 1969 (UK) Bohlig *et al.*, 1970 (FRG) Selikoff *et al.*, 1970 (USA) Elmes & Simpson, 1971 (UK) Stumphius, 1971 (The Netherlands) Rubino *et al.*, 1972 (Italy)	Lung cancer, pleural and peritoneal mesotheliomas	Asbestos manufacturing, insulation and shipyard workers
Selikoff *et al.*, 1973	Lung cancer	Insulation workers; chrysotile and amosite asbestos exposure
Enterline *et al.*, 1972 Enterline & Henderson, 1973	Respiratory cancer	Retired production and maintenance workers in asbestos industry
Cooper *et al.*, 1975	Lung cancer	Sheet-metal workers
De Lajartre *et al.*, 1976 Biava *et al.*, 1976 Harries, 1976	Mesothelioma	Shipyard workers Shipyard workers Naval dockyard workers
Edge, 1976	Carcinoma of bronchus	Shipyard workers
Newhouse, 1973a Newhouse & Berry, 1976	Lung cancer	Asbestos workers
De Lajartre *et al.*, 1973 (France) Gobbato & Ferri, 1973 (Italy) Puntoni *et al.*, 1976 (Italy) Webster, 1973 (South Africa) Greenberg & Lloyd Davies, 1974 (UK) Hain *et al.*, 1974 (FRG) Nurminen, 1975 (Finland) Sturm & Bittersohl, 1975 (GDR) Zielhuis *et al.*, 1975 (The Netherlands) Milne, 1976 (Australia)	Evidence of association between mesothelioma and past exposure to asbestos	Occupational exposures, in some cases as brief as one day
Newhouse *et al.*, 1972 Selikoff *et al.*, 1970	Peritoneal tumours associated with heavy exposures	
Gilson, 1973 Hammond & Selikoff, 1973 Selikoff, 1976a	5% to 10% asbestos workers' deaths due to mesothelioma	
Newhouse & Berry, 1976	8-11% asbestos workers' deaths due to mesothelioma	
Martischnig *et al.*, 1977 Peto *et al.*, 1977	Lung cancer	Asbestos workers Asbestos textile workers
Nicholson *et al.*, 1977	Lung cancer, mesothelioma	Asbestos workers
Single types of fibres		
Crocidolite		
Wagner *et al.*, 1960	Pleural cancer	Workers in mines, mills and transportation and handling of crocidolite and population in vicinity of mines

OVER

Reference	Finding	Group and exposure
Harington *et al.*, 1971; Webster, 1973	Mesothelioma	Mining population of crocidolite mines
McNulty, 1962	Mesothelioma	Miners of crocidolite
Jones *et al.*, 1976	Mesothelioma	Women working with crocidolite in WWII gas-mask canister factories
Chrysotile		
McDonald *et al.*, 1973, 1974; McDonald & McDonald, 1976	Lung cancer, mesothelioma	Chrysotile mine and mill workers
Kogan *et al.*, 1972	Total cancer, lung cancer	Workers in asbestos mining and milling, men and women
Wagoner *et al.*, 1973	Respiratory cancer	Workers in manufacturing of textile, friction and packaging products, using chrysotile
Enterline & Henderson, 1973; Enterline *et al.*, 1972	Respiratory cancer	Men 65 years and older, retired production or maintenance employees in asbestos industry exposed only to chrysotile
Borow *et al.*, 1973	Mesothelioma	Workers at plant using chrysotile, all ages
Amosite		
Selikoff, 1976a	Mesothelioma, lung cancer	Insulation workers in factory using amosite
Seidman *et al.*, 1977	Lung cancer	Insulation workers in factory using amosite
Anthophyllite		
Meurman *et al.*, 1974	Bronchial cancer, dyspnoea and cough	Anthophyllite mining employees
Other cancers		
Enterline, 1965; Hammond *et al.*, 1965; Mancuso & El-Attar, 1967; Elmes & Simpson, 1971; Kogan *et al.*, 1972; Newhouse, 1973b; Wagoner *et al.*, 1973; Selikoff, 1974, 1976b; Selikoff *et al.*, 1964, 1972b; Nicholson *et al.*, 1977	Cancer of gastrointestinal tract	Asbestos workers
Stell & McGill, 1973; Morgan & Shettigara, 1976	Laryngeal cancer	Workers with exposure to asbestos
Newhouse & Berry, 1973; Shettigara & Morgan, 1975	Laryngeal cancer	Asbestos workers
Selikoff *et al.*, 1970	Oropharyngeal cancer	Asbestos workers
Dohner *et al.*, 1975	Multiple primary cancers	Shipyard workers
B. SMOKING AND ASBESTOS		
Selikoff *et al.*, 1968; Doll, 1971; Berry *et al.*, 1972; Hammond & Selikoff, 1973	Lung cancer	Asbestos workers
C. NON-OCCUPATIONAL EXPOSURES		
Anderson *et al.*, 1976	Mesothelioma	Family members of asbestos workers
Wagner *et al.*, 1960; Newhouse & Thompson, 1965; Bohlig & Hain, 1973	Mesothelioma	Individuals in neighbourhood of industrial sources of asbestos
Greenberg & Lloyd Davies, 1974	Mesothelioma	New cases from areas with recognized industrial source of asbestos
D. ASBESTIFORM MINERALS		
Kleinfeld *et al.*, 1967	Lung, pleural, peritoneal, gastro-intestinal tract cancers	Talc miners and millers
Gillam *et al.*, 1976	Respiratory cancer	Underground gold mines

APPENDIX 9.

ON AN OCCUPATIONAL STANDARD
FOR EXPOSURE TO ASBESTOS

M. Finkelstein, Ph.D., M.D.

August 21, 1978.

ASBESTOS

The Asbestos Minerals

Asbestos is the general term given to a group of minerals that are fibrous in character and resistant to high temperatures. These hydrated silicates fall into two categories; (1) Serpentine, the fibers of which are curved in a wide variety of shapes, usually occurring in partially opened bundles of very fine fibers, and (2) the Amphiboles, straight needle - like fibers. The only asbestos mined in Canada is the serpentine, chrysotile; a white, usually long, silky fiber. Others of commercial importance are the amphiboles, crocidolite and amosite. Some of these fibrous minerals also occur in the bearer rocks of mines developed primarily for the exploitation of other minerals, such as talc, mica, and iron, as for example, in the iron mines at the head of Lake Superior and in Labrador.

Differences in the physical properties of the various fibers determine their particular commercial usefulness. Thus, for example, chrysotile, which consists of long, mainly pliable fibers that split progressively into finer fibrils, lends itself to incorporation into textiles, whereas crocidolite and amosite, which are more acid resistant, are of particular value for marine insulation. Certain asbestos cement products may be made from blends of chrysotile and amosite and/or crocidolite.

Source

A large proportion of the world's production of chrysotile is from Canada, principally from Quebec. Canada imports some crocidolite and amosite for special processes.

Uses of Asbestos: Occupations at Risk

Asbestos has a wide variety of uses and many occupations are potentially at risk from exposure. These occupations include asbestos mining and milling, and handling in preparation for its use either directly (as, for instance, in spraying when mixed with oil)or for its incorporation into the manufacture of a great variety of asbestos - containing products. The latter may be classified

broadly into textiles, asbestos-cement and other construction products, paper products, friction materials, and insulation products. It is also used in the chemical and plastics industries.

Once incorporated into manufactured items the fiber is relatively well bound and is less likely to pose a health hazard to the workers who use these products, so long as the product is not sawn, disrupted, or cut in any way. Asbestos fibers may be released into the atmosphere again when the original product is removed, replaced, or destroyed, as may occur in the construction industry in connection with demolition and repair.

Indirect Exposure - (Domestic, Neighbourhood, Environmental).

Exposure to asbestos fiber is not confined to the place of work; the search for exposure in the background of patients with mesothelioma has brought to light several forms of indirect nonoccupational exposure, as has occurred in family members of asbestos workers, and residents in the neighbourhoods of mines, mills, or factories. Ambient air sampling in European and North American cities has shown asbestos fibers to be present upon electron microscopic examination, usually in very low concentration.

Chrysotile has also been found in the air of buildings insulated with asbestos building materials and in the homes of asbestos workers. Only a very few studies have been performed using phase contrast optical microscopy in the general environment, and these indicate ambient levels to be generally less than 0.01 fibers greater than 5 microns per ml.[B]

Dust Measurement

Current asbestos standards are defined in terms of measurements made by polarized light optical microscopy on specimens obtained by membrane filtration. This is felt to be the only practical and economically feasible method of measurement.

Addingley[1] discusses asbestos dust and its measurement. He finds that a dust slide of chrysotile asbestos contains almost all sizes and shapes, from small particles less than 1 micron to irregular shapes up to 20 microns or so in each dimension, together with a number of obvious fiber bundles and of long thin fibers. Clumps of broken asbestos fibers appear as irregular plate-like particles.

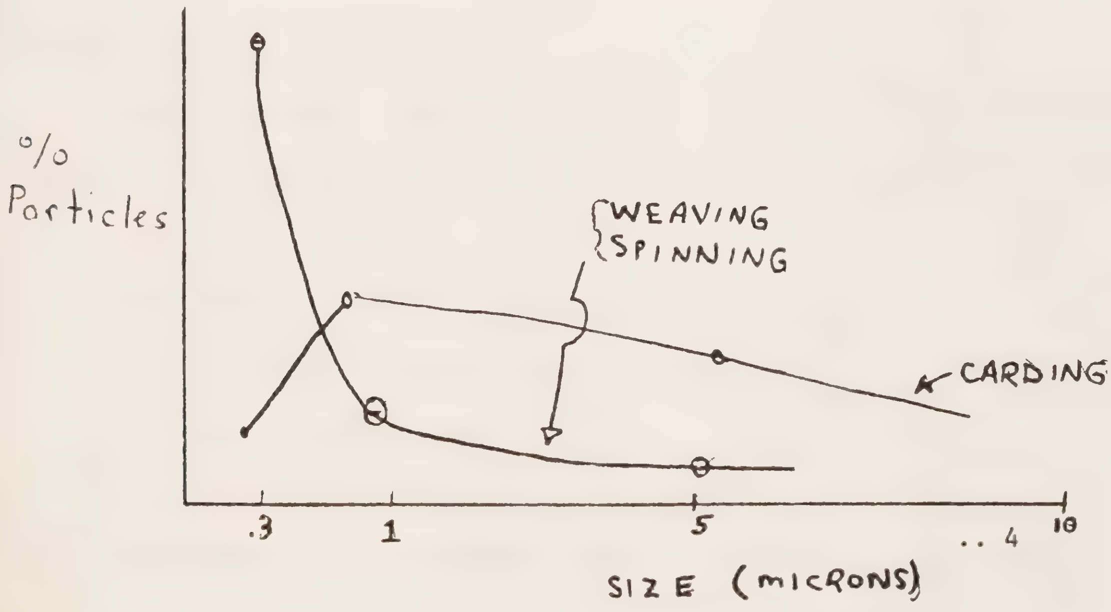
For counting and sizing under the microscope, a group of 3 British asbestos manufacturers arbitrarily adopted a count of fibers between 5 and 100 microns. This was done because:

1) It greatly simplifies counting and minimizes inter-observer error.

2) It was believed that most processes in asbestos textile factories produced dust which had a similar size range, and very roughly, a similar proportion of different sizes. More recent measurements have shown that different processes produce a different size spectrum.

3) It was felt that the development of asbestosis was related to longer fibers, i.e. greater than 5 microns.

Addingley[1] determined the particle size distribution for various processes in an asbestos textile factory using a photo-electric counter technique, and the results are presented below.



Prior to the current era, most dust measurements were made using techniques which measured total particulate matter, thus including contaminant dusts as well as asbestos. These values were expressed as million particles per cubic foot (mppcf). It is extremely difficult, if not impossible, to convert from one unit of measurement to the other. Ayer et al[2] measured the ratio between the membrane filter count and the impinger counts for textile plants, and found that ratios differed for different operations in the same plants and for similar operations in different plants. Gibbs and Lachance[3] compared midget impinger counts with membrane filter counts collected side by side at 5 Quebec mines and mills, and found that correlation was poor, and that no single conversion factor was justified. They recommended that safety standards in the mining industry continue to be based on impinger counts, which had formed the basis for epidemiologic studies.

In summary, the currently recommended monitoring techniques are based on issues of feasibility and practicality, rather than on any scientific determination of pathogenic fiber spectra in man. The hope and intention is that by controlling exposure in the measurable range of fiber lengths, control of pathogenic fibers will ensue. This will be discussed further below.

Health Aspects of Asbestos Exposure

Asbestos exposure in man has been shown to be related to the subsequent development of both malignant and non-malignant disease. The principal forms of asbestos - related disease are:

1) Asbestosis - a diffuse fibrosis of lung tissue
2) Pleural thickening and calcification
3) Carcinoma of the lung
4) Carcinoma of the larynx and G.I. tact
5) Mesothelioma - a malignant tumor of the pleura or peritoneum

The manner in which asbestos causes disease in man is currently a matter of intensive investigation, and is not yet clearly defined. Clinical, epidemiologic, and experimental studies have failed to establish a role for chemical factors related to asbestos, and research has emphasized the physical form of the asbestos fibers. There has been much interest in the relationship of fiber dimension and form to various stages of the pathogenic process, from entrance into the body to the possible mechanism of cell transformation, and much disagreement as to the critical values.[(4)]

Timbrell[(5)] has discussed the characteristics of respirable asbestos fibers in a study of both rat and human lung sections. He used both optical and electron microscopy, as some of the fibers were very slender and not visible by optical microscopy. He observed fibers of amphibole dusts to be straight, with uniform diameter over the whole fiber length. By contrast, chrysotile fibers were curved in a wide variety of shapes and consisted of bundles of very fine fibrils, usually partially opened. He noted that a striking feature of asbestos fibers in lung sections was their considerable length in comparison to other respirable particles. He further noted that the fibers in the terminal air sacs were generally shorter than those in the air ducts, which in turn were shorter than those in the dust cloud. He explains that the feasibility of long fibers penetrating the lung and reaching the pulmonary air spaces is explained by the fact that the falling speed of a fiber depends mainly upon the square of its diameter, and is not very sensitive to length. A long fiber (if it is thin enough) can avoid being deposited by gravitational settlement or inertial precipitation high in the respiratory tract and may penetrate deeply into the lung. The observed concentration of long fibers in the respiratory bronchioles is explained by the fact that the probability of a fiber intercepting the wall of an airway becomes greater with increase in fiber length and with decrease in airway diameter. Consequently, whereas interception is not important in the

trachea and larger airways, it is a very efficient deposition mechanism for long fibers in the smaller airways. The small airways progressively filter out the long fibers, so that those in the air ducts are longer than those which penetrate deeper.

With regard to the question of relative efficiency of pulmonary penetration of fibers of amphibole and chrysotile asbestos he notes an experiment by Wagner[6] in which rats exposed to asbestos dust clouds retained six timesas much of the amphibole samples, after several months, as chrysotile. He suggests that this may be partly due to the characteristic rectilinear shape of amphibole fibers, compared to the curly morphology of chrysotile fibers, which could cause amphibole fibers to penetrate to the deeper parts of the lung more efficiently than the chrysotile fibers. There is a lack of information on whether asbestos fibers can reach the pleura during inhalation or whether they migrate to this region.

In humans, a study by Fondimare[7] concerning length and diameter of 5000 asbestos fibers from the lungs of 10 deceased persons who had been occupationally exposed to asbestos, found that fibers were all less than 0.5 microns in diameter, and that 90% of chrysotile fibers were less than 5 microns in length.

Major unanswered questions involve the manner in which asbestos fibers induce disease and the pathogenic fiber spectrum in man. There is a consensus in the literature that the longer fibers greater than 5 microns in length are responsible for the fibrosis appearing in asbestotic lung disease. Gross[8] cites several animal studies to support this point of view, and other authors concur. There is no such agreement, however, with regard to carcinogenesis.

Inhalation studies in animals have not addressed themselves to the question of fiber spectrum, but studies have been done on the induction of mesotheliomas by the placement of asbestos fiber in the pleural cavities of animals.

Wagner and Berry[9] produced mesotheliomas in rats with chrysotile and the amphiboles. Ninety percent of the chrysotile asbestos fibers were less than 6 microns in length and 51% were less than 2 microns. The sample of chrysotile which produced mesotheliomas in as many as 66% of rats was a super-fine sample produced by sedimentation separation.

By contrast, Stanton and Wrench[10] introduced asbestos into the pleural cavities of rats and noted that submicroscopic particles with diameters less than 0.2 microns appeared to be less carcinogenic, however they did produce some mesotheliomas with all fiber spectra tested.

Wagner, Berry and Timbrell[11] also performed inoculation experiments in rats, producing mesotheliomas with all samples tested. In analyzing their data, they classified as "significant" those fibers less than 0.5 microns in diameter and greater than 10 microns in length. They found that the number of tumors produced by different samples was correlated with the number of "significant fibers present.

Timbrell[12] in discussing these experiments, points out that the carcinogenic trend appears related to fiber diameter; the finer the fiber, the more carcinogenic it tends to be. In terms of inter-fiber differences, he points out that the amphiboles are probably more dangerous because their needle-like shape allows deeper penetration and a longer residence time in the lung.

It should be pointed out that these animal studies imply an equal carcinogenic potential for each of the fiber types, but in man, chrysotile appears to be much less important as a cause of mesothelioma, as its curly shape precludes easy penetration as far as the pleural cavity.

In summary, there is a consensus that fibers greater than 5 microns in length are the dangerous fibers with respect to fibrosis. There is no experimental data concerning fiber size and carcinoma of the lung, and conflicting evidence as to whether or not short fibers are more or less dangerous in the development of mesothelioma. In terms of respirability,

and probably in terms of carcinogenesis, fibers of diameter less than 0.5 microns appear most important. This is of significance in that the limit of resolution in optical microscopy is about 0.36 microns, and so electron microscopy would be needed to detect most of these fibers.

Asbestosis

Diffuse interstitial fibrosis of the lung associated with asbestos exposure was the first recognized "asbestos disease". Pathologically, the inflammatory reaction is believed to relate to the retained "dose" of asbestos fiber. For mild and moderate fibrosis this appears to be true in man and animal. However, there does not appear to be further progression from moderate to severe fibrosis associated with an increase in dose, and it is thus postulated that other inflammatory mechanisms must have a role in the progression from moderate to severe fibrosis.

Studies have shown that workers other than those continuously exposed to asbestos are also at risk for development of asbestosis. Murphy et al[13] found 11 cases of asbestosis in 101 pipe insulators working in a New England shipyard, with an average exposure of 120 mppcf -years. The prevalence was 38% after 20 years of occupational exposure. Lorimer et al[14] in a study of brake repair and maintenance workers exposed to asbestos, found that 25% of the workers showed evidence of X-ray abnormalities consistent with asbestosis.

Historically, asbestos standards have been set based upon epidemiological studies of the development of asbestosis in asbestos textile workers. In 1968, the British Occupational Hygiene Society (B.O.H.S.) proposed a standard, based on a study of workers in a British textile factory, with the intention of reducing the lifetime risk of developing the earliest signs of asbestosis to 1%.[15] This standard was later adopted by the United States (which has since proposed modifications) and forms the basis for the current Ontario standard.

In this study, workers who were currently employed and who had been exposed for at least 10 years were examined and the prevalence of lung crepitations was related to cumulative dust exposure. A log-normal dose-response

curve fitted the data adequately and led to the prediction that the cumulative dose corresponding to a 1% lifelong risk of developing crepitations was approximately 100 fiber-years/ml or 2fibers/ml for 50 years. Most men with cumulative exposures of less than 100 fiber-years/ ml had been employed for between 10 and 20 years at average dust levels of less than 10 fibers/ml. The absence of crepitations in this group was the basis for the prediction that the effect of 50 years exposure at 2 fibers/ml would be minimal.

This standard has been reviewed by several workers. Berry[16] discusses the problems of basing a hygiene standard on the assumed existence of a threshold. He reminds us that one cannot determine a threshold from epidemiologic data, as, for example, if at a certain dose there were no cases of disease out of 1,000 individuals at risk, then from a statistical point of view, it could only be stated with reasonable certainty that the risk was less than 3 in 1000. The B.O.H.S. estimate has its associated statistical error, and he points out that there is a reasonable chance that the risk at 100 fiber-years/ml is as high as 3%. For a 95% certainty that the risk not exceed 1%, the dose would have to be no more than 50 fiber-years/ml.

Peto[17] examines the assumptions inherent in the B.O.H.S. standard and points out that with somewhat different assumptions, such as that (1) pulmonary damage caused by inhaled asbestos dust is progressive, and (2) crepitations rarely appear less than 10 years after first exposure, then the predicted risk could be an order of magnitude higher than 1% at 50 years of exposure.

An examination of the B.O.H.S. data leads one to question the accuracy with which one can suggest a standard even with the assumptions implied. A variety of dust sampling techniques were employed, with cellulose membrane counting not introduced until 1965. As noted previously, correlation between fiber and total particle counts is not good. They also noted a coefficient of variation in their data of about 40%.

The few American studies published are not particularly helpful. Murphy et al[13] examined pipe insulators in a shipyard exposed to amosite asbestos and found that signs of asbestosis begin to appear after 10 years exposure. They noted no asbestosis in men exposed at less than 60 mppcf - years, a prevalence of 20% in men exposed at 75-100 mppcf-years and 38% for men at greater than 100 mppcf-years. Dust concentrations were determined with a midget impinger and cannot be readily converted to fibers/ml.

The mortality experience of the B.O.H.S. cohort of workers has been discussed by Peto.[17] In their cohort, which averaged a cumulative dose of 200 fiber-years/ml, there were 17 deaths (9.2 expected) due to non-malignant respiratory disease over 25 years after first exposure, including 5 attributed to asbestosis. He suggests that further data on early pulmonary signs may indicate whether a threshold exists, but even if the incidence of crepitations is linearly related to dust level, the prognosis in affected workers may be related to the severity of preceding exposure.

In summary, asbestosis is a scarring disease of the lung, related to inhalation of asbestos fibers. It is felt that the fibers important in the pathogenesis of the disease are the longer fibers greater than 5 microns in length. The development of mild and moderately severe disease is felt to be related to the "dose" of retained fiber. The standard of 2 fibers/ml has been adopted with the hope of restricting the development of the earliest signs of the disease to no more than 1% of the work force. The accuracy of the 1% figure is open to serious question and there is no data as yet concerning the health of workers exposed exclusively at these lower levels.

Mesothelioma

Mesothelioma is a malignant tumor of the linings of the chest and abdominal cavities and is a very rare tumor in the general population. Numerous international studies have shown an association between mesothelioma and past exposure to asbestos, some of them showing an association with exposure as brief

as 1 day; however approximately 15% of mesotheliomas cannot be shown to be related to exposure to asbestos, and so this may be misleading in terms of risk. All commercial fibers except anthophyllite, but including talc, have been implicated, but there are important between - fiber differences in mesothelioma risk, being greatest with crocidolite, less with amosite, and apparently even less with chrysotile. With amosite and chrysotile there appears to be a higher risk in manufacturing than in mining and milling. These were the conclusions reached by the Advisory Committee on Asbestos Cancers at the Lyon meeting.[18] Unlike bronchial cancer, smoking does not appear to play a synergistic role in the development of mesotheliomas.

With regard to the dose-response relationship between asbestos and mesothelioma, quantitative information is not available; however, it appears that low levels of exposure may be important in disease production, as there has been a documented association with apparently low levels of exposure for relatively brief periods in the remote past from neighbourhood or domestic sources.[A] The commonest documented neighbourhood exposure is that of children playing in the streets within ½ mile of a factory or mine, usually for several years in early childhood, although one cannot usually be certain that they did not also play in the waste or tailings. It is likely, though, that neighbourhood exposures would have been less than those to which workers themselves were exposed.

Milne[19] in a retrospective study of mesothelioma victims in Australia, cites 5 cases in which duration of exposure was a year at most, and in which exposure was 25 or more years before manifestation of the tumor.

Newhouse and Berry[20] studied workers in a London textile factory and divided workers qualitatively on the basis of probable exposure according to job classification. They found an increased incidence in workers subject to severe rather than moderate exposures, and in those workers exposed for greater than 2 years as opposed to those exposed for less than 2 years.

In autopsy material from mesothelioma victims, when dose is measured

by number of asbestos bodies and/or fibers in pathologic material, this is found to be higher than in the general population, although lower than usually seen in relation to pulmonary fibrosis.

In summary, there is an association between asbestos exposure and mesothelioma, with the risk associated with chrysotile apparently less than for the amphibole asbestos group. Smoking does not appear to be an additional risk factor. There is no indication of a safe exposure level and so any exposure must be considered a potential hazard. One cannot with the data available calculate with any reliability the potential risk at any exposure level.

Carcinoma of the Lung

Epidemiologic studies have confirmed the association between asbestos exposure and lung cancer, mortality experience being the chief method of study. There has been demonstrated an unquestionable interaction between cigarettes and asbestos exposure as risk factors. Carcinoma of the lung appears to develop very rarely in the non-smoker exposed to asbestos, whereas the risk associated with exposure to both is considerably more than additive and probably multiplicative.

The relative risk appears to be higher in industrial workers than in miners, and has varied from study to study, being in the range 1.0 to 13.

There would appear to be an increased risk with increasing exposure, but the precise form of the dose-response relationship is not known. In the absence of evidence to the contrary, one must accept the hypothesis that in terms of carcinogenesis, there is no safe threshold value. Peto[17] discusses a linear model for cancer induction. He shows that the data of Enterline,[21] for asbestos workers, and McDonald,[22] for Quebec chrysotile miners, comparing relative risk with cumulative dose in mppcf-years, can be fitted with a linear model. He then applies this linearity assumption to the cohort of workers involved in the B.O.H.S. study. He notes that the excess risk appears to be confined to the period beyond 25 years after first exposure. He uses average exposure figures and estimates of early dust levels to calculate an average

cumulative dose close to 200 fiber-years/ml. He further notes that exposure was predominantly to chrysotile, with occasional exposures to crocidolite.

In this cohort, mortality due to lung cancers other than pleural mesothelioma has been approximately twice the British national average beyond 25 years after first exposure (14 observed vs 6.6 expected). Peto suggests that if the eventual proportional increase in mortality due to bronchial carcinoma is approximately linearly related to cumulative exposure, and the risk is doubled at 200 fiber-years/ml, a level of 1 fiber/ml might after 50 years exposure increase mortality due to this cause by 25%, corresponding to a lifelong risk of bronchial carcinoma attributable to asbestos of about 3% in British smokers. The risk to non-smokers is probably very small. He also applies a more general linear model to the British workman and concludes that 20 years exposure at about 1 fiber/ml is likely to cause bronchial carcinoma in roughly 1 man in 100.

Due to uncertainties in employment histories and individual exposures, Peto acknowledges that his predictions might be grossly inaccurate, and admits that the assumption that there is no safe threshold cannot be confirmed without long-term prospective observation of workers exposed to low levels. He concludes by quoting the International Agency for Research on Cancer Monograph[18] which concludes that "at present, it is not possible to assess whether there is a level of exposure in humans below which an increased risk of cancer would not occur".

Based on current knowledge, we are unable to reliably predict the excess risk at any exposure level.

Current Standards

There is no world-wide unanimity of opinion as to what the optimal occupational asbestos standards should be. The proposed Ontario standard for asbestos fibers greater than 5 micrometers in length is:

1) The time weighted average exposure limit for
   a) Chrysotile: 2 fibers/cc
   b) Amosite and Crocidolite: 0.2 fibers/cc

2) The ceiling exposure limit for

a) Chrysotile: 10 fibers/cc

b) Amosite and Crocidolite: 2 fibers/cc

The British standard was proposed by the British Occupational Hygiene Society in 1968 and was set at 2 fibers/cc for chrysotile. At that time the B.O.H.S. was uncertain that standards for other fibers should follow by "analogy". They subsequently proposed the same standards for amosite, but a standard ten times more stringent for crocidolite was promulgated by government regulation.

In the United States, the standard has been revised downwards several times in the past decade. In 1971, 5 fibers/cc was adopted as the time-weighted average emergency standard for all U.S. industries. In October 1975, 0.5 fibers/cc was proposed by O.S.H.A. as the maximum time-weighted average exposure. In July 1976, the standard of 2 fibers/cc was mandated.

NIOSH in December 1976 published their latest recommendations calling for a standard of 0.1 fibers/cc on an 8 hour T.W.A. basis with peak concentrations not exceeding 0.5 fibers/cc based on a 15 minute sample period. They comment upon their recommendation as follows:[B]

"Available studies provide conclusive evidence that exposure to asbestos fibers causes cancer and asbestosis in man. Lung cancers and asbestosis have occurred following exposure to chrysotile, crocidolite and amosite. Mesotheliomas, lung and gastrointestinal cancers have been shown to be excessive in occupationally exposed persons, while mesotheliomas have developed also in individuals living in the neighbourhood of asbestos factories and near crocidolite deposits, and in persons living with asbestos workers.

Likewise, all commercial forms of asbestos are carcinogenic in rats. Mesotheliomas and lung cancers were induced following even 1 day's exposure by inhalation.

The size and shape of the fibers are important factors; fibers less than 0.5 micron in diameter are most active in producing tumors. There are data that show that the lower the exposure, the lower the risk of developing cancer.

Excessive cancer risks have been demonstrated at all fiber concentrations studied to date. Evaluation of all available human data provides no evidence for a threshold or for a "safe" level of asbestos exposure.

In view of the above, the standard should be set at the lowest level detectable by available analytical techniques. Such a standard should also prevent the development of asbestosis. The recommended standard is intended to (1) protect against the non-carcinogenic effects of asbestos, (2) materially reduce the risk of asbestos - induced cancer (only a ban can assure complete protection), and (3) be measured by techniques that are valid, reproducible, and available to industry and official agencies."

Commenting on this standard, Rajhans[23] states that his study on asbestos exposures indicates that it is not possible to monitor the levels on 0.1 fibers/cc reliably, but this is an engineering consideration. From a health point of view, it would be difficult to argue against the NIOSH position that the lower the exposure, the lower the risk. The major difficulty in setting a standard is that at the present moment we are unable to reliably suggest a risk at any given exposure level.

Should there be different standards for the different asbestos fibers? Again, the data is not clear. It is believed that there are gradients in the mesothelioma - producing potential related to fiber type (greatest with crocidolite, less with amosite and with chrysotile, least with anthophyllite) and to occupation (e.g., for amosite, greater in insulation workers than in miners). Gradients in fibrogenic capability of the different fibers, less clear, may also be present, with crocidolite leading chrysotile, whereas gradients in lung cancer risk may be more closely related to the nature of the exposure, with production leading mining, at least for chrysotile.[A] No quantitative estimates of risk are available.

Conclusions

The major difficulties in proposing an occupational standard for asbestos are that all the toxic effects are long term, and that there is insufficient data available to permit a reliable estimate of health risk at any given exposure level. It is conceivable that there may be a safe threshold to prevent the development of asbestosis, but, as with most carcinogenic substances, one cannot, at this time, assume the existence of a threshold for asbestos carcinogenesis.

A further difficulty relates to the probable non-overlap of fiber-size spectrum in the workplace with respirability and pathogenicity. The fiber distribution in the workplace depends upon the nature of the work process. Respirability depends upon fiber diameter and length, as well as upon the type of asbestos, and is optimal for fibers less than 0.5 microns in diameter. This presents the practical difficulty that most respirable fibers will be below the limit of resolution of optical microscopy. As far as pathogenicity is concerned, there is general agreement that fibers greater than 5 microns in length are most likely responsible for the fibrosis seen in asbestosis, but there is no consensus as to the dangerous fibers in carcinogenesis. As concerns fiber type, the amphiboles appear to be more dangerous in the production of mesothelioma.

The consensus in the literature would appear to be that phase-constrast optical microscopy is the only practical method to monitor workplace exposures. Unfortunately, it would appear that most respirable fibers are at or below the limits of resolution by this technique. The intention is, of course, to control the entire fiber spectrum by controlling that portion which can be monitored by optical microscopy. Until such time as the situation is clarified, it would be reasonable to obtain correlations by periodic monitoring by electron microscopy as well.

The writer of this report finds it a difficult matter to recommend any particular number to be used as an occupational standard, but recognizes the necessity of making such a choice. Certainly, from a health point of view, this standard should be set as low as possible.

There is only one study available in the literature which gives a useable risk estimate, and this is the study of Peto(17) based on the mortality experience of the BOHS factory cohort. Peto found the relative risk of death from carcinoma of the lung, beyond 25 years after first exposure, to be doubled at an average (estimated) cumulative exposure of 200 fiber-years/cc. In Ontario, currently, the proportionate mortality ratios for pulmonary cancer (pulmonary cancer/total deaths) for men in the age groups 45 years of age and beyond is about 7-9%, i.e., about 1 man in 12 in Ontario dies of cancer of the lung. Using Peto's result, and applying a linear model of relative risk versus exposure, one could predict the deaths of 2 workers in 12 as a result of pulmonary cancer at an exposure of 200 fiber-years/cc, with an excess death rate due to pulmonary cancer of 8 men in 100 attributable to asbestos exposure.

In workers who smoke, the risk from this exposure is likely to be greater, and the risk is probably negligible in non-smokers. Thus, using this estimate, which it must be emphasized is quite unreliable, 25 years exposure of a smoking asbestos worker at the proposed Ontario standard of 2 fibers/cc might lead to an excess mortality from lung cancer of 2 workers in 100. A standard of 1 fiber/cc might, after 25 years exposure, lead to an excess cancer mortality of 1 in 100. Again it must be emphasized that smoking is an extremely important risk factor. Because of the long latent period of induction, this cause of death probably does not lead to a dramatic reduction of life expectancy of the group.

The total risk is probably underestimated as there is an added risk due to mesothelioma which cannot be quantitated at present.

The general consensus in the literature is that the amphibole group of asbestos fibers is more dangerous than chrysotile in the production of mesothelioma, although there is no great consensus as to the relative risk in the other forms of asbestos disease. The setting of a standard of 0.2 fibers/cc for the amphiboles is arbitrary, but is probably an important safety regulation, although there is as yet no data in the literature to quantitatively support this figure.

As noted above, the setting of a standard at 1-2 fibers/cc <u>might</u> produce an excess cancer risk of 1-2% over 25 years of exposure. This might be compared to the current occupational standard for radiation workers, where exposure at the maximum permitted occupational level over 25 years leads to an estimated excess cancer risk of about 1%. As most radiation workers are exposed well below the limit, the proposed asbestos standard cannot be viewed as being conservative.

Asbestos disease is an active area of ongoing research. It is to be hoped that over the next few years new information will appear which will enable rational ongoing re-evaluation of any occupational standard. In the meanwhile, it is urged that this standard be set as low as possible.

References (General)

The following articles are well-documented reviews of the asbestos problem.

A) Becklake, M.R.
Asbestos-Related Diseases of the Lung and Other Organs
American Review of Respiratory Disease 114, 187, 1976.

b) N.I.O.S.H.
Revised Recommended Asbestos Standard.
U.S. Department of Health, Education, and Welfare December, 197

References (particular)

1. Addingley, C.G.,
Asbestos Dust and its Measurements,
Ann. Occ. Hyg., 9, 2, 1966.

2. Ayer, H.E., Lynch, J.R., and Fanney, J.H.,
A Comparison of Impinger and Membrane Filter
Techniques for Evaluating Air Samples in Asbestos Plants.
Ann. N.Y. Acad. Sci. Vol.132, pp.274-287, 1965.

3. Gibbs, G.W., and LaChance, M.,
Dust-Fiber Relationships in the Quebec Chrysotile Industry.
Arch. Environ. Health. 28, 69, 1974.
Insert References on hand-written sheet (next page).

4. Kannerstein, M., Churg, J., McCaughey, E., Selikoff, I.,
Pathogenic Effects of Asbestos.
Arch. Path. Lab. Med. 101, 623, 1977.

5. Timbrell, V.,
The Inhalation of Fibers
in Shapiro, H., ed., Pneumoconiosis
Proc. Internat. Conf. Oxford U. Press 1970. p.3.

6. Wagner, J.C.,
The Significance of Asbestos in Tissue.
in Grundmann, E., and Tulinus, H., eds.
Current Problems in the Epidemiology of Cancer and Lymphomas,
New York, Springer Verlag, p. 37.

7. Fondimare, A.,
Arch. Anat. Pathol. (Paris) 22, 55, 1974.

8. Gross, P.,
Is Short-Fibered Asbestos Dust a Biological Hazard?
Arch. of Environ. Health 19, 115, 1974.

9. Wagner, J.C., and Berry, G.,
Mesotheliomas in Rats Following Inoculation with Asbestos.
Br. J. of Cancer 23, 567, 1969.

10. Stanton, M.F. and Wrench, C.,
Mechanisms of Mesothelioma Induction with Asbestos and Fibrous Glass.
J. of Nat. Cancer Inst. 48, 797, 1972.

References (particular)

11. Wagner, J.C., Berry, G., Timbrell, V.,
Mesotheliomata in Rats After Inoculation with Asbestos and other materials.
Br. J. Cancer 28, 173, 1973.

12. Timbrell, V.,
Physical Factors as Etiological Mechanisms in Biological Effects of Asbestos.
I.A.R.C. Scientific Publication No. 8 1973, p. 295.

13. Murphy, R., Ferris, G.,
Effects of Low Concentrations of Asbestos.
N. Engl. J. Med. 285, 1271, 1971.

14. Lorimer, W.V.,
Asbestos Exposure of Brake Repair Workers in the United States
Environmental Sciences Laboratory, Mt. Sinai School of Medicine.

15. British Occupational Hygiene Society.
Hygiene Standards for Chrysotile Asbestos Dust.
Ann. Occ. Hyg. 11, 47, 1968.

16. Berry, G.,
Hygiene Standards - Theory and Application in Biological Effects of Asbestos,
I.A.R.C. Publication No. 8 (1973).

17. Peto, J.,
The Hygiene Standard for Chrysotile Asbestos.
Lancet pg. 484, March, 1978.

18. I.A.R.C.,
Monographs, Volume 14 (1976).

19. Milne, J.E.,
Thirty-two cases of Mesothelioma in Victoria, Australia.
Br. J. Ind. Med. 33, 115 (1976).

20. Newhouse, M., and Berry, G.,
Predictions of Mortality from Mesothelial Tumors in Asbestos Factory Workers.
Br. J. Ind. Med. 33, 147 (1976).

21. Enterline, P., de Coufle, P., Henderson, V.,
Respiratory Cancer in Relation to Occupational Exposures among Retired Asbestos Workers.
Br. J. Ind. Med. 30, 162 (1973).

References (particular)

22. McDonald, J.C., Becklake, M.R., Gibbs, G., McDonald, A.D., Rossiter, C.E.,
The Health of Chrysotile Asbestos Mine and Mill Workers of Quebec.
Arch. Environ. Health 28, 61 (1974).

23. Rajhans, G.S.,
Here's an Update on Asbestos.
Occ. Health and Safety, Nov. 1977.

24. Davis, J., Beckett, S., Bolton, R., Collings, P., and Middleton, A.,
Mass and Number of Fibers in the Pathogenesis of Asbestos-Related Lung Disease in Rats.

25. Wagner, J., Berry, G., Skidmore, J., and Timbrell, V.,
The Effects of the Inhalation of Asbestos in Rats.
Br. J. Cancer 29, 252, 1974.

APPENDIX 10.

MORTALITY AMONG WORKERS RECEIVING COMPENSATION FOR ASBESTOSIS IN ONTARIO

Murray Finkelstein, Ph.D.,M.D.

and

Robert Kusiak, M.Sc.

of

Special Studies and Services Branch
Ontario Ministry of Labour

George Suranyi, M.Sc.
Program Planning & Statistical
Services Branch
Ontario Workmen's Compensation Board

Reprint Requests to:

Dr. Murray Finkelstein
Ontario Ministry of Labour
400 University Avenue, 8th Floor
Toronto, Ontario
M7A 1T7

November, 1980

It has been known for a number of years that populations of workers exposed to asbestos dust risk not only the development of the fibrotic lung disease, asbestosis, but also increased mortality rates from a number of diseases including mesothelioma, lung cancer, and gastrointestinal cancers. Recent reviews of the epidemiological evidence concerning asbestos-related diseases may be found in References 1 and 2.

The epidemiology of pneumoconiosis in Canada was recently investigated by the Task Force on Occupational Respiratory Disease of the Canadian Thoracic Society and Health and Welfare Canada. Their report presented statistics concerning the numbers of workers awarded compensation for asbestosis by Provincial Workmen's Compensation Boards from 1965 - 74, as well as the numbers of deaths in Canada, from 1965 - 1974, receiving the I.C.D. Codes for asbestosis[3]. They found that there were 877 compensation awards for asbestosis in Canada during those years, with the majority, 696, coming from Quebec. In the same interval there were 39 deaths attributed to asbestosis. In this study, we have investigated mortality from all causes among the group of 172 men awarded compensation for asbestosis by the Ontario Workmen's Compensation Board from the time of the first award in 1942 until mid-1979.

There are several ways in which workers who have developed asbestosis have come to the attention of the Ontario Workmen's Compensation Board. Most of the men in this study were under medical surveillance by the Occupational Chest Disease Service of the Ontario Ministry of Labour which examines individuals with a significant potential occupational exposure to asbestos dust every 6 - 18 months while they continue to be employed in the exposure environment. Workers with evidence of early pneumoconiosis or with long histories of exposure continue to be examined following termination of exposure and these individuals are usually invited to return periodically for

examination following termination of employment or after retirement. The other men in the study group were self-referred to the Board, or else referred by their physicians on the basis of suspicion of compensable disease. It is quite likely that asbestosis has developed in some Ontario workers who have not filed compensation claims with the Compensation Board. We believe, however, that in view of the publicity given to asbestos matters in recent years, workers with significant asbestos-related chest disease have had a reasonable likelihood to submit claims for compensation, and that our study group probably contains a sizeable fraction of Ontario workers who have developed asbestosis.

Workers coming to the attention of the Board are examined by a review committee. On the basis of exposure history, a clinical examination (including examination for crepitations, clubbing, and cyanosis), radiographic examination, and pulmonary function testing, the committee decides whether or not a diagnosis of asbestosis is justified and makes a recommendation to the Board. The individuals are re-examined periodically by the committee and recommendations for disability pension adjustments are made, as appropriate.

Method:

From the files of the Ontario Workmen's Compensation Board and the Occupational Chest Disease Service of the Ontario Ministry of Labour we collected information about all workers who received a compensation award for asbestosis up to the cut-off date of July 1, 1979. We did not include in our study group any of the additional number of individuals who received compensation awards solely on the basis of having developed malignancies believed to be asbestos-related.

The majority of the men received compensation awards within the past ten years. There were 20 awards given between 1942 and 1969, and 152 between 1970 and mid-

1979. The mean age at the time of award was about 56 years, and the mean ages in the two calendar-period subgroups did not differ significantly from one another.

The workers fell mainly into two employment categories: asbestos-cement factory workers (91 men) and insulation workers (52 men). The remaining individuals were scattered over a number of industries and trades including asbestos textile and brake-lining manufacturing, pipe-fitting, ship-building, mining, and maintenance.

Since these men receive pensions from the Compensation Board, the Board is informed of their deaths as they occur, and we obtained the official death certificate codings and causes of death from the Provincial Registrar. For some of these men, the Board had obtained additional information about the cause of death in the form of hospital records, biopsy, and autopsy reports. Some of this material had been reviewed by the Board's pathology consultant; we did not attempt to have the remainder reviewed, but accepted the examining pathologists' diagnoses in those cases.

Smoking histories were abstracted from the clinical records of the Chest Service and the workers were classified as smokers, ex-smokers, or never-smokers.

Mortality rates in this group of asbestotics were compared with mortality rates in the male population of Ontario by the usual man-years approach, with each individual contributing to the period of observation from the date of his compensation award until his death, or else, to the end of 1979. Expected numbers of deaths for the observation period were calculated from age and calendar specific death rates for the general Ontario male population. The statistical significance of differences between the observed and expected numbers of deaths was tested by assuming that the expected number of deaths formed the mean of a Poisson distribution.

A life-table analysis[4] was used to study survival from the date of award. An "expected" survival curve was calculated by creating a hypothetical control group of Ontario males matched in age to the members of the asbestosis study group. Each individual in the control group was followed for the potential number of years of follow-up of his match, and the cumulative probability of survival for each of these men was obtained from Ontario Life Tables published by Statistics Canada. The cumulative probabilities for each of the individuals were then summed to obtain the survival curve for the control group.

The standard error of the survival curve for the study group of compensated workers was calculated using the Greenwood approximation.[4]

Results:

Sixty-one deaths occurred among the 172 asbestotics in the study group by the end of the follow-up period, December 31, 1979. The distribution of deaths, classified by age at the time of compensation award, is presented in Table I. This Table also presents the mortality rates in each age-group, as well as a comparison of these rates with the All-cause mortality rates expected for an age-matched group of Ontario males. The increase in mortality rates ranged from a factor of 19 among men in the 35-44 age group to a factor of 3 among men of retirement age.

In Table II, we present the causes of death of the men in each of these age groups, classified according to the official death certificate codings. The numbers in brackets reflect the changes that occur when the additional information available to the Board is taken into account. We have indicated the causes of death included in each descriptive category by reference to codings from the Eighth Revision of the International Classification of Diseases.

These groupings are as follows: Non-malignant respiratory diseases (ICD: 460-519); Lung cancer (ICD: 162); Mesothelioma (Pleural - ICD: 163.0 and Peritoneal-ICD: 158); Gastrointestinal cancer (ICD: 150-154); and Ischemic heart disease (ICD:410-414).

Non-malignant respiratory diseases were the major causes of death overall, but malignancies were an important cause of death as well. Malignant mesothelioma was under-represented as a cause of death in the official codings. Three peritoneal mesotheliomas were mentioned on the death certificates, and were so coded. A fourth peritoneal mesothelioma, which was diagnosed at autopsy, was listed on the death certificate as "Carcinomatosis - Unknown Primary" and received I.C.D. code 199.0 (Multiple malignant neoplasm). Three pleural mesotheliomas were listed on the death certificates as the cause of death; of these, two were coded 162.1 (malignant neoplasm of bronchus and lung) and one received I.C.D. code 228 (Benign neoplasm of unspecified organs and tissues). Two additional pleural mesotheliomas were diagnosed at autopsy, but these received the codes 162.1 and 185 (malignant neoplasm of prostate). Taking account of this additional information, we have noted that, in our study group, the number of deaths from mesothelioma has equalled the number of deaths from lung cancer, with nine deaths from each cause. The mean age at death of the nine men who died of mesothelioma was 54.7 years (σ=9.3) while the mean age at death of those who died of lung cancer was 65.3 years (σ=9.9). The mean interval from first occupational exposure to asbestos to death from mesothelioma was 28 years; none of the deaths from mesothelioma occurred prior to 20 years from first exposure.

In Table III, we present a comparison between observed mortality and the mortality predicted from Ontario population rates. The observed deaths are classified according to the official death certificate codings; the effect of adjustments made when the additional information available to the Board is taken into account is indicated

by the bracketed figures. Mortality rates from all causes, all malignancies, lung cancer, mesothelioma, and non-malignant respiratory diseases were found to be elevated to a statistically significant extent.

In Table IV we present a separate analysis of mortality among the sub-groups of asbestos-cement factory workers and insulation workers.

With respect to smoking histories, 15% of the men in the study group claimed never to have smoked cigarettes, while the numbers of men admitting to be current or ex-smokers were roughly equal at about 42% each. Two of the 9 men dying of mesothelioma claimed never to have smoked, as did 4 of the 22 men coded as dying from non-malignant respiratory disease. All of the men dying from lung cancer had smoked cigarettes.

In Figure I we present the survival curve, measured from the date of compensation award, for the group of asbestotics, together with the curve calculated for the hypothetical control group. With observation until the end of 1979, the relative survival rate for the asbestotics was 69% at 5 years from the date of compensation award and 53% at 10 years from compensation.

Discussion:

The mortality experience of the group of workers receiving compensation for asbestosis in Ontario is consistent with that observed among asbestos workers world-wide, with increased mortality rates from respiratory disease, lung cancer, and mesothelioma. These elevated mortality rates have been reflected in a five-year survival rate only 69% of that expected for a group of Ontario males of the same age distribution. Not surprisingly, we did not observe a statistically significant increase in mortality from gastrointestinal cancer; the number of man-years of observation was too small to detect an increased risk of gastrointestinal cancer of less than a factor of 3 or 4.

We have observed that none of the 5 cases of pleural mesothelioma were officially coded as such. When account was taken of pathological evidence available to the Board we noted that, in this group of asbestotics, there were equal numbers of lung cancers and mesotheliomas. It would be expected that a group of workers with sufficient asbestos exposure to produce disability from asbestosis would be at particularly high risk to develop mesotheliomas.

The exposure conditions experienced by many of these workers is uncertain. Some quantitative information, in the form of air sampling data and work histories, is available for employees of the asbestos-cement factory and a study is currently in progress to determine the exposure-response relationships for asbestosis and mortality among employees of this factory. Workers at this plant were exposed to mixed dusts of chrysotile and crocidolite asbestos. The insulation workers in our study group were probably exposed to amosite asbestos as well as to chrysotile and crocidolite, but no quantitative information is available about their exposures. Although the mortality rates observed among the asbestos-cement workers and insulators have been placed side-by-side in Table IV, these rates should not be directly compared; the age distributions of these two groups are different (the insulation-workers tended to be younger at the time of compensation award) and the exposure conditions were undoubtedly quite different.

We have observed that workers receiving compensation awards for asbestosis in Ontario have had a decreased life expectancy in comparison with the general population. Most of the men in this group were first exposed to asbestos dust over 20 years ago, when hygiene conditions were considerably worse than they are today. Efforts must be continued to create and maintain conditions such that the risk of development of this disease is minimal.

Acknowledgements:

The co-operation of the Ontario Workmen's Compensation Board and the Occupational Chest Disease Service of the Ontario Ministry of Labour is gratefully acknowledged.

References:

1. Selikoff, I.J., and Lee, D.H.K.
Asbestos and Disease
Academic Press, New York, 1978

2. Asbestos: Final report of the advisory committee
Volume 2: Papers commissioned by the committee
London: HMSO, 1979

3. Task Force on Occupational Respiratory Disease (Pneumoconiosis)
Ottawa: Health and Welfare Canada, 1979

4. Colton, T.,
Statistics in Medicine, Chapter 9
Little, Brown and Company, Boston, 1974

TABLE I

DISTRIBUTION OF DEATHS BY
AGE AT TIME OF AWARD

Age at Award	35-44	45-54	55-64	65 and over
umber of Men	22	44	83	23
an-Years of Observation	102	186	360	85
umber of Deaths	9	12	26	14
verage Age at Death	46	53	63	72
ortality Rate (Deaths per 100 Man-Years).	8.9	6.5	7.2	16.5
ortality Rate in atched Ontario Male opulation Deaths per 100 Man-Years)	0.47	1.2	2.6	5.3
atio of Rate in sbestotics compared o Ontario Population.	19	5.4	2.8	3.1

CAUSES OF DEATH CATEGORIZED BY AGE
AT TIME OF COMPENSATION AWARD**

CAUSE	AGE 35 - 44	45 - 54	55 - 64	65 or older
Non-Malignant Respiratory Disease (ICD: 460 - 519)	5 (5)	3 (3)	8 (8)	7 (6)
Lung Cancer (ICD: 162)	1 (1)	2 (1)	4 (3)	4 (4)
Mesothelioma (Pleural, Peritoneal)	0 (1)	3 (5)	0 (1)	0 (2)
Gastrointestinal Cancer (ICD: 150 - 154)	0 (0)	0 (0)	2 (2)	0 (0)
Ischemic Heart Disease (ICD: 410 - 414)	1 (1)	1 (1)	4 (4)	2 (2)
Others	2 (1)	3 (2)	7 (7)	2 (1)

** Classified according to official death certificate codings. The numbers in brackets are the results of modifications made when the additional evidence available to the Board was taken into account.

TABLE III

OBSERVED VERSUS EXPECTED MORTALITY AMONG ASBESTOTICS

733 MAN-YEARS OF OBSERVATION.

Cause	Observed	Expected	Ratio	Statistical Significance
All Causes	61 (61)†	16.6	3.7	$P < 0.01$
All Malignancy	22 (24)	4.0	5.5	$P < 0.01$
Lung Cancer	11 (8)	1.4	7.9	$P < 0.01$
Mesothelioma	3 (10)	$\ll 1$	-	$P < 0.01$
G.I. Tract Cancer*	2 (2)	1.0	2.0	Not Significant
Non-Malignant Respiratory Disease	23 (22)	1.1	20.9	$P < 0.01$
Ischemic Heart Disease	8 (8)	6.7	1.2	Not Significant

* G.I. Tract Cancer includes Esophagus, Stomach, Intestines and Rectum.

\+ The numbers in brackets are the results of modifications made when the additional evidence available to the Board is taken into account.

TABLE IV

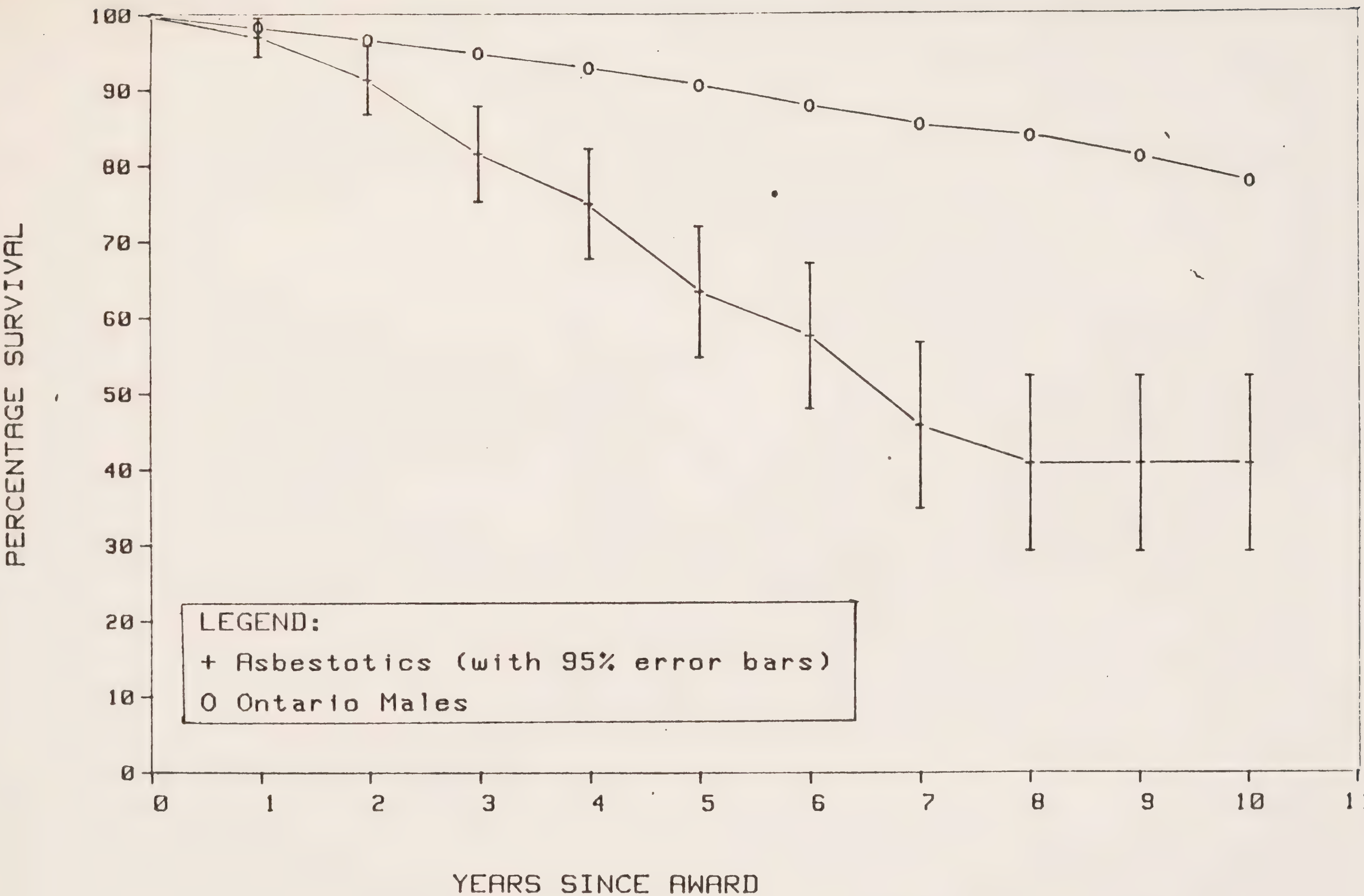
MORTALITY AMONG ASBESTOS-CEMENT WORKERS AND INSULATORS

Cause	Asbestos-Cement Factory Workers: 91 Men, 338 Man-Years of Observation				Insulation Workers: 52 Men, 282 Man-Years of Observation			
	Observed	Expected	Ratio	Significance	Observed	Expected	Ratio	Significance
All Causes	29 (29)+	6.9	4.2	$P < 0.01$	19 (19)	6.5	2.9	$P < 0.01$
All Malignancy	12 (14)	1.7	7.1	$P < 0.01$	6 (6)	1.6	3.8	$P < 0.01$
Lung Cancer	6 (4)	0.6	10	$P < 0.01$	3 (2)	0.5	6	Not significant
Mesothelioma	2 (7)	$<<1$	-	-	1 (2)	$<<1$	-	-
Gastrointestinal Cancer *	1 (1)	0.4	2.5	Not significant	1 (1)	0.4	2.5	Not significant
Non-Malignant Respiratory Disease	7 (6)	0.4	17.5	$P < 0.01$	9 (9)	0.4	22.5	$P < 0.01$
Ischemic Heart Disease	4 (4)	2.8	1.4	Not significant	2 (2)	2.5	0.8	Not significant

* Gastrointestinal Cancer includes Esophagus, Stomach, Intestines and Rectum.

\+ The numbers in brackets are the results of modifications made when the additional evidence available to the Board is taken into account.

Figure I: OBSERVED and EXPECTED SURVIVAL CURVES



Canadian Centre for
Occupational Health and Safety

Centre canadien d'hygiène et
de sécurité au travail

44

Health Sciences Centre
1200 Main St. W.,
Suite 3N25
P.O.Box 2000
Stn. A
Hamilton, Ontario
L8N 3Z5
(416) 527-6590

SUBMISSION

by

THE CANADIAN CENTRE FOR OCCUPATIONAL HEALTH AND SAFETY

to

ROYAL COMMISSION on MATTERS of HEALTH and SAFETY
ARISING FROM THE USE OF ASBESTOS IN ONTARIO

CHRONOLOGY OF KNOWLEDGE:

Understanding of the Health Risks of Asbestos in the Public Health, Legal and Other Non-Medical Literature

by Wendy King

January 1981

INTRODUCTION

As part of its Survey of Studies on asbestos prepared for the Royal Commission on Asbestos in Ontario October 1980, the Canadian Centre for Occupational Health and Safety (CCOHS) compiled a Chronology of Understanding of the Health Risks of Asbestos in the Medical Literature. This chronology appears in the Survey of Studies as Appendix C.

Although the Royal Commission required a chronology based purely on the medical literature for the Survey of Studies, encouragement was given to do a different type of chronology based on a wider range of sources.

Therefore, the attached chronology has been prepared and submitted. It demonstrates some of what is known about the knowledge and consequent actions of workers, asbestos company management, insurance companies, labour unions, government and medical authorities, lawyers, and independent researchers. It is not in any way intended to be a comprehensive or exhaustive overview.

The importance of some of the information included in this "non-medical" chronology may be more readily understood if it is read together with Appendix C of our Survey of Studies.

The chronology was researched and prepared by CCOHS Research Officer Wendy E. King with the assistance of Word Processor/ Secretary Lynn Lahie.

1868	Research and development of asbestos carried out by industry founder Henry W. JOHNS was published in the United States. The same year asbestos was first used in roofing felt and cement. In 1873 Johns' first factory was established. (I.SELIKOFF & D.LEE Asbestos and Disease Academic Press 1978 p.17-18)
1879	Asbestos was first mined for wide commercial use in Thetford Mines, Quebec. Canada has since become the world's largest producer of chrysotile (white asbestos), accounting for over 40 per cent of world production. About 80 per cent of Canada's total asbestos production is mined and milled in Quebec. (P. BERGERON et al Report of the Asbestosis Working Group. Dept. of National Health and Welfare Canada Ottawa 1976 p.4 in L. TATARYN Dying for a Living, Deneau and Greenberg, 1979)
1886	C.B. MANVILLE and his three sons formed the Manville Covering Company in Milwaukee, Wisconsin. The company specialized in asbestos pipe coverings and insulations for plumbing and heating systems. (T. MOORE Bread and Butter - Early Grave unpublished 1978)
1888	The Bell Asbestos Co. in collaboration with the textile mills of Turner Bros. in Lancashire, England, produced yarns made from Quebec chrysotile (white asbestos). In 1890 textile processing of Quebec asbestos began in the United States. (SELIKOFF & LEE op.cit.1978)

1898	H. JOHNS, American asbestos industry founder, died of asbestosis. His death certificate lists the cause of death as "dust phthisis pneumonitis" (dust disease of the lungs with pneumonia as the immediate cause of death.) Mr Johns patented asbestos roofing products, bought asbestos mines and manufactured fireproof textiles and insulation. (Statement of Barry CASTLEMAN before the U.S. Subcommittee on Crime, House Judiciary Committee Nov. 15, 1979 on H.R. 4973)
1899	The "evil effects" of airborne asbestos dust were reported and it was called injurious in any quantity. (Women Inspectors of Factories. Annual Report for 1898. London England HMSO p.170).
1900	H. Montague MURRAY completed the first autopsy description of pulmonary fibrosis in an asbestos worker. (Charing Cross Hospital Gazette. London England)
1902	Adelaide ANDERSON, British Lady Inspector of Factories, included asbestos in the list of dusts known to be injurious to humans, which indicates general awareness prior to this date that asbestos could be a serious hazard. (Historical Sketch of the Development of Legislation for Injurious and Dangerous Industries in England. Oliver, T. (Ed.) Dangerous Trades New York: Dutton (1902).
1903	Asbestos cement was first produced in the United States after the asbestos pipe industry began in Italy around 1900; flat asbestos-cement board manufacture began in 1904; in 1906 asbestos was first used in brake linings; and by 1910 the mineral had been combined with formaldehyde resins. (SELIKOFF & LEE opt cit. 1978)

1908 L. SCARPA told an international medical congress in Italy that asbestos workers with severe progressive pulmonary disease (1894-1906) were diagnosed as having tuberculosis.
(Industria Dell'amianto e tuberculosi. Proceedings of the 18th International Medical Congress. p.358 (1908)

1912 The Canadian Labour Gazette reported the weakening effect of asbestos dust on the health of Quebec asbestos mine and mill workers:
" One of the oldest medical practitioners in Thetford expressed the view that the asbestos dust floating in the atmosphere of the the cobbing room had a weakening effect on the lungs of those employed. He had several cases of tuberculosis under treatment but recognized that conditions in the mills had been declared greatly improved since the introduction of the new apparatus for allaying the dust ". An inquiry failed to reveal disease attributable to any specific cause.
(Effect of Asbestos Dust on Workers' Health in Asbestos Mines and Factories. Labour Gazette Canada, p.761-762, 12 February)

1918 Believing the risk of death among asbestos workers to be three times that of the general population, life insurance companies increased their premiums to match the increased risk. Some insurance companies were already refusing to sell life insurance to asbestos workers. F.L. HOFFMAN documented this situation.
(Mortality from Respiratory Diseases in the Dusty Trades. Bulletin of Bureau of Labour Statistics No. 231. Industrial Accidents and Hygiene Series No. 17. U.S. Bureau of Labour, Washington, D.C. p.458 and Paul BRODEUR Expendable Americans. New York, Viking Press Inc. 1974, p.6)

1924 W.E. COOKE wrote -
"Medical men in areas where asbestos is manufactured have long suspected the dust to be the cause of chronic bronchitis and fibrosis". (Fibrosis of the Lungs Due to the Inhalation of Asbestos Dust. Brit. Med. J. 2. p.147)

1929 A.C. HADDOW reported secondary cause of death on one certificate to be "asbestos poisoning"; no tuberculosis involvement.
(Clincal Aspects of Pulmonary Asbestosis. Brit. Med. J. p.204)

1930 Study by COLLIS in Canada (1910-1911), cited by MEREWETHER, points to the probability "that asbestos possessed injurious properties". Factors in delay of recognition were said to be the primitive stage of development of radiography in 1910, mortality statistics hidden in category "dust phthisis", no real measurements available for dust level, voluntary X-rays and only mildly irritating effects of the dust on the upper respiratory tract.
(The Occurrence of Pulmonary Fibrosis and Other Pulmonary Affections in Asbestos Workers. J. of Ind. Hyg. 12 p.198-222, 239-257. May and June)

1930 E.R.A. MEREWETHER :
"Fibrosis of the type produced by asbestos dust can of itself lead to complete disablement, and finally to a fatal termination, even in the absence of a superadded tuberculosis infection." (The Occurrence of Pulmonary Fibrosis and Other Pulmonary Affections in Asbestos Workers J. Ind. Hyg. cited in The Labour Gazette December 1930 Canada)

1930 MILLS authored a report at the Mayo Clinic where an autopsy on a cardiac victim revealed heart failure due to asbestosis.
"Apparently once asbestos dust enters the lung it continues to injure the tissues as long as the person lives. In short asbestosis is an incurable disease."
(Pulmonary asbestosis: Report of a Case. Minnesota Medical Journal 13. p.495-99)

1931 Asbestos Regulations adopted in Great Britain made asbestosis a compensable disease.
(Asbestos Industry Regulations. Statutory Rules and Orders, No.1140. HMSO, London. 1931)

"Prosecutions for breaches of the 1931 Asbestos Regulations for the 40-odd years they were in force were extremely rare".
(Parliamentary Commissioner (U.K.) 1975 reported by G.R.C. ATHERLEY in Occupational Health and Safety concepts: Chemical and Processing Hazards. Applied Science Pub. London 1978, p.298)

1933 The Board of Directors of the Johns-Manville Corporation settled eleven asbestosis cases for "$33,000 provided written assurance were obtained from the attorney for the various plaintiffs that he would not directly or indirectly participate in the bringing of new actions against the company."
(Statement of Barry CASTLEMAN before the U.S. Subcommittee on Crime, House Judiciary November 15, 1979 H.R. 4973.

..."such provision (that cases be settled providing the workers' attorney agree to remain silent) is virtually unheard of in the settlement of civil litigation."... "its (J-M's Board of Directors) imposition of silence was ... clever ... since asbestos litigation did not begin to flourish in this country for another forty to forty-five years".
(Statement of Steven KAZAN before The Subcommittee on Crime U.S. House Committee on the Judiciary H.R. 4973. March 24, 1980.)

1934 GRAY, Surgical Director for Aetna Life Insurance Co. wrote "...asbestosis is incurable and usually results in total permanent disability followed by death...it will become more prevalent as the industry grows."
(Attorney's Textbook of Medicine. Matthew Bender & Co. 1934)

1934 Letter from attorney HOBART to Vandiver BROWN (Legal Department of Johns-Manville): states opposition to the recognition of asbestos disease as a compensable occupational disease under U.S. Workmen's Compensation; requests deletion or modification in galleys reviewed prior to publication of inferences that pneumoconiosis may arise more readily from asbestos than granite dust, and of references to an "unnecessarily dusty" plant of another manufacturer.
(December 15, 1934. G.A. PETERS Sourcebook on Asbestos Diseases: Medical, Legal, and Engineering Aspects. Garland STPM Press, 1980)

1935 A. LANZA was "approached by officials representing the asbestos industry in the United States who were desirous of ascertaining whether asbestos dust was an occupational hazard in their establishments".

A Metropolitan Life Insurance Co. study of five Canadian and Atlantic seaboard mines and mills (1929-1931) was then done by Lanza et al. Conclusions: prolonged exposure can cause pulmonary fibrosis; dust control depends upon properly constructed ventilation equipment; 4% of X-rays showed extensive lung disease and 50% showed pneumoconiosis. Recommended that industry seriously face the problem of dust control in asbestos plants.
(The Effect of Inhalation of Asbestos Dust on the Lungs of Asbestos Workers. U.S. Public Health Report 50 p.1-12; also in Journal of Industrial Hygiene 17, p.33 and Bulletin of Hygiene 10, p.554)

1935 Asbestosis became compensable in New York state. Legal specialist George HOBART noted that Johns-Manville was in danger of having asbestosis recognized as a compensable occupational disease in the 1935 session of the New Jersey Legislative Commission. J-M's largest manufacturing plant was in Manville, N.J.

J-M attorney V. BROWN explained to Dr. LANZA of the Metropolitan Life Insurance Co. that: "...all we ask is that all of the favourable aspects of the survey be included and none of the unfavourable be pictured in darker tones than the circumstances justify".

Lanza made a number of the suggested changes, and asbestosis did not become a compensable disease in New Jersey until 1945.
(G.A. PETERS Sourcebook op. cit.)

1935 "...the first report of a link between asbestos and carcinoma of the lung had been made by LYNCH and SMITH, in the U.S.A., as early as 1935. A near-contemporary report in Britain, by MEREWETHER, had suggested that 17.7% of a male population with asbestosis had died of lung malignancy."
(G.R.C. ATHERLEY Occupational Health and Safety Concepts. op. cit. p.297.)

1936 Letter of S. SIMPSON (Raybestos-Manhattan) to Jeffords (General Asbestos and Rubber Division): suggests X-rays of all employees[not only those exposed to asbestos] be carried out as part of a U.S. Public Health Service survey to avoid arousing suspicion of asbestos employees; did not want those X-rays given to lawyers and doctors because of concern about lawsuits. (October 31, 1936)

Letter of S. Simpson (Raybestos-Manhattan to Schulter (President of Thermal Rubber) about Saranac Labs' experiment proposal, to be paid for by industry, because of need for courtroom data and need to disseminate the "right type" of information to the "medical fraternity"; suggests meeting of six major manufacturers. (November 10, 1936)
(G.A. PETERS Sourcebook op. cit.)

1937 "As regards medical inspection of industry there can hardly be said to be any inspection of this kind in Canada. In no Canadian province do medical inspectors form part of the factory inspectorate and there is no regular medical inspection of factories as in Great Britain and several European countries."
(Legislation in Canada Concerning Occupational Diseases. The Labour Gazette. June 1937 p. 623)

1938 VORWALD and KARR reported negative results, regarded by many as controversial, in trying to show experimentally-induced cancer with asbestos. The study was done at Saranac Laboratories under the sponsorship of the Quebec Asbestos Mining Association.
(Pneumoconiosis and Pulmonary Carcinoma. Amer. J. of Path. 14 pg. 49)

1939 Letter of S. SIMPSON (Raybestos-Manhattan) to V.Brown (Johns-Manville):
"The less said about asbestos, the better".
(G.A. PETERS Sourcebook op. cit.)

1939 German insurance organizations (carriers) were paying death benefits for asbestosis, and recognition was noted that life expectancy is reduced by asbestos exposure in paper by E.BAADER.
(Asbestose Dentsch Medizinische Wochenschrift 65, p.407. Mar.17)

1939-45	Johns-Manville, the largest asbestos mining, milling, and manufacturing company in the Western world, grew most rapidly during and after the Second World War. Demand for asbestos reached a peak during these years due to its use as insulation for ships' boilers. From $3 million annual sales in 1901, J-M's revenue reached $1.5 billion in 1977. By then the company had 25,400 employees. (J-M's 1977 Annual Report p. 18 and T. MOORE Bread and Butter - Early Grave unpublished 1978)
1940	Asbestosis was compensated among shipyard workers in Germany, and insulators were taken away from asbestos exposure for two years. Replacement of asbestos by other insulating materials was carried out. (Archiv fur Gewerbepathologie und Gewerbehygiene 10, No.2 p.133-150 July 20)
1941	Lab chief and pathologist L. GARDNER performed a study at Saranac Lake Laboratories while under contract with Quebec Asbestos Mining Association, whose predominant member was Johns-Manville. He concluded: "To produce the effects characteristic of asbestosis in the human lung a very particular environment is essential"... "In organs other than the lungs, asbestos generally dissolves and (asbestos) bodies practically never develop..." He attributed the problem mainly to the chemical environment of the lung tissue. (Chrysotile Asbestos as an Indicator of Subtile Differences in Animal Tissue. Amer. Rev. of Tuberculosis 45 p.762)
1943	Official Quebec province death rates attributable to pulmonary tuberculosis are 10 times higher at Thetford Mines, Quebec, where the population is "continuously exposed to extraordinarily heavy concentrations of asbestos dust", than the rates at Sorel and Granby, where townspeople and workers are not exposed to asbestos dust at all.

"Confronted by the abnormally high tuberculosis mortality rates at Thetford Mines, neither the medical profession nor the provincial government can evade the issue ... either inhalation of asbestos dust predisposes to and aggravates pulmonary tuberculosis, or many deaths certified at Thetford Mines as having been due to tuberculosis were inacurately diagnosed, and in reality were due to asbestosis."
(Burton LeDOUX Asbestosis East Broughton Quebec, Canada. January 1949).

1945 The British Factory Inspectorate sent a letter to members of the Thermal Insulators Contractors Association warning of asbestosis hazards in shipyards and suggesting control measures.
(G.A. PETERS Sourcebook op. cit.)

1946 In the latter part of World War II a survey on the potential for asbestos disease hazards in U.S. shipyards failed to demonstrate the prevalence of significant asbestos disease. No evidence of disease was found in 1,074 ship insulation workers employed in U.S. yards. However, it was not appreciated that a large majority of the men had begun working only a short time before the study; neither was it understood that X-ray evidence of disease could not be expected to appear until one or two decades later.

Later investigations of insulation manufacturing employees showed markedly increased risk of asbestosis and cancer with as little as one month of employment.
(I. SELIKOFF and E. HAMMOND Asbestos - Associated Disease in United States Shipyards Cancer Journal for Clinicians March/April 1978.)

1946-48	Dust at the newly-opened Johns- Manville asbestos pipe plant in Scarborough, Ontario was so thick that visibility was sometimes only a few yards. Men worked without any protection. In 1948 the plant began production of asbestos cement, pipe and rock wool insulation. A high turnover rate of the 500 waged and 150 salaried workers has meant that over 6,000 men have worked at the plant over a 30-year period. (T.MOORE op.cit.1978)
1948	Dr.Wilhelm HEUPER : "Since 1935, a total of 23 cases of asbestos cancer of the lung has been reported by American, English and German investigators." "The asbestos industry in the United States employed some 19,000 workers in 1944. More than 10,000 of these were exposed appreciably to asbestos dust. Despite this high percentage of exposed individuals, the incidence of asbestosis is low. This information contrasts strongly with that available from Germany, where BOEHME found radiological evidence of asbestosis in 29 percent (of 132 asbestos factory workers)." (<u>Environmental and Occupational Cancer</u> Supplement 209, Public Health Reports. U.S. Public Health Service p.20 1948)
1949	At the arbitration tribunal into Quebec's asbestos labour unrest, Dr. Arthur VORWALD testified on behalf of the asbestos companies and their industrial clinic. He was then the U.S. director of an industry-sponsored laboratory researching lung disorders.
Question:	So, possibly it would be accurate to say that a man who lost an eye suffered from an impairment. Would not the condition of the worker who is suffering from a substantial degree of fibrosis in the lung be much the same?

Vorwald: No, I don't think so. He has an impairment of his lung tissue but he is not suffering from it. (Tribunal D'Arbitage institue pour regler la difference entre Asbestos Corporation Ltd. et Le Syndicat National des Travailleurs de L'Asbestos Corp. Ltd. Inc. vol. 8 Sept. 23, 1949, p.71) in (L.TATARYN op cit.)

1949 Dr. Kenneth W. SMITH, medical officer for Johns-Manville Canada in Asbestos, Quebec noted in report to company's head office in U.S. that asbestosis was "irreversible and permanent" and added "but as long as a man is not disabled it is felt he should not be told of his condition so that he can live and work in peace and the company can benefit from his many years of experience".

According to Smith, the reaction of J-M executives was: "We know we are producing disease in the employees who manufacture these products and there is no question in my [our] mind that disease is being produced in non-J-M employees who may use certain of these products". (L. TATARYN Dying for a Living, p.29,30., 1979) and (L. MARTIN Asbestos workers not told of hazards, papers indicate Globe and Mail, November 23, 1978.)

1949 An editorial in the Journal of the American Medical Association said:

"Since some 20,000 workers are employed in the asbestos-producing industries of this country and Canada and many additional thousands in various asbestos-consuming industries, increased attention to this probable occupational hazard of cancer of the lung by the medical profession is desirable". (Asbestosis and Cancer of the Lung. Editorial JAMA 140 p.1219-20))

1949 A British Factory Inspector recorded that arrangements for handling the crude asbestos were "criticized strongly to the management of the Hebden Bridge mill and that some of the methods being used to eliminate dust were "unsatisfactory".

It was thought by the 1975 Parliamentary Commission that the Factory Inspectorate did not subject the management to as much pressure as it might;... that the Inspectorate failed to make full use of available statistics,... and that they did not take a sufficiently firm line in regard to asbestos dust prior to the introduction of the 1969 Asbestos Regulations.
(G.R.C. ATHERLEY. Occupational Health and Safety Concepts: Chemical and Processing Hazards. Applied Science Publishers London p.298, 1978)

1949 The violent five-month asbestos strike in Quebec led by the Confederation of Catholic Workers against the asbestos industry was a landmark battle. Working conditions were key; the first union demand was the "elimination of asbestos dust inside and outside the mills."
(F. ISBISTER "Asbestos 1949" in Abella, ed. On Strike James Lewis and Samuel, Toronto 1974)

The arbitration board dealing with the 1949 dispute handed down the following decision: "The Company recognizes that the asbestos dust is harmful. It states that it is prepared to continue the work, which it has already begun, to eliminate it... This clause may not in any way be interpreted as a contractual obligation on the part of the Company..."
(P.E. TRUDEAU ed. The Asbestos Strike trans. James Boake. Toronto James Lewis and Samuel, 1947 p.336) in (Lloyd TATARYN Dying for a Living, 1979)

1950 West Germany classified cancer of the lung, when associated with any degree of asbestosis, an occupational disease.
(P. ENTERLINE Editorial Asbestos and Cancer: the International Lag - Amer. Rev. of Resp. Disease vol.118, 1978)

1952 A Scarborough Johns-Manville plant worker who mixed asbestos fibre, silica and cement by hand to be fed into pipe-forming machines , recalls that conditions were so bad... "there were times you couldn't see six inches in front of your face".
(John DODDS Interview with T. MOORE in Bread and Butter - Early Grave 1978)

Dry sweeping was the standard practice at SJ-M until 1975.
(Eddy CAUCHI Interview with T.MOORE op cit.)

1954 Letter from LUTTENBERGER to Hugh JACKSON (Johns-Manville) discusses release of hygiene information, expressing confidence that medical group would not release information that might create a feeling in the minds of employees or the public that the asbestos industry is hazardous; mentions that Traveller's Insurance and the U.S. Federal Government were working on dust control techniques.
(May 13, 1954 in G.A. PETERS op. cit.)

1958 According to the U.S. Environmental Protection Agency, spray materials containing 5% to 80% asbestos by weight were used extensively in the U.S. from 1958 through 1973 to fireproof girders, spandrels, and decking of buildings constructed of structural steel.
(I. Selikoff and E. Hammond Asbestos Bodies in the New York City population in two periods of time. In Pneumoconiosis Proc. Inter. Conf. Johannesburg. H.A. Shapiro (ed.) Cape Town: Oxford U. Press, 1970.)

1960 By this date, sixty-three scientific papers on the problem of asbestos exposure and health had been published in the U.S., Great Britain, and Canada. The fifty-two papers published independently of the asbestos industry showed asbestos to be a dangerous source of asbestosis and lung cancer; the eleven industry-sponsored papers presented virtually the opposite conclusions, rejecting the connection between asbestos exposure and lung cancer and minimizing the seriousness of asbestos.
(Daniel M. BERMAN Death on the Job: Occupational Health and Safety Struggles in the United States Monthly Review Press NY 1978)

1960 A "safe" standard of 177 particles of asbestos dust per cubic centimeter of air is accepted by the Industrial Health Advisory Committee (Britain), based on a level set by the American Conference of Governmental Industrial Hygienists. In 1968 a U.K. Medical Advisory Panel report said this standard was to be replaced with a system of fibre counts -- a provisional standard for airborne dust exposure of 1.9 to 7.7 fibre counts per cubic centimeter was recommended.
(L.MICHAELS and S. CHISSICK eds. Asbestos Vol.1 Properties, Applications, and Hazards. John Wiley & Sons, p.8, 1979.)

1960's "Although J-M knew of the risks to... plantworkers, it took no steps to warn them or their employers. It would have been a simple matter to affix a brief warning label to the bags of raw asbestos fibre in 1933 ... Johns-Manville never used warning labels on asbestos raw or manufactured, until the late 1960's".
(Statement of Steven KAZAN before the U.S. Subcommittee on Crime. House Committee on the Judiciary H.R. 4973 March 24, 1980)

1961 "In the American literature there is no evidence that there is a relationship between asbestos and lung cancer".
(Questions and Answers Journal of American Medical Association 176:81 April 8,1961)

After being challenged on this by Dr.G.TRIMBLE in a later edition of the journal, consultant R.JOHNSTONE said:
"It may be that there is a relationship between lung cancer and exposure to asbestos. However...there is no epidemiological evidence of such in American workers." A February 1961 article appearing in the same journal says : "Textbook descriptions of clinical diseases are often considered inadequate today unless a section on epidemiology accompanies the...etiology and pathology."
(Letters JAMA Oct.21,1961 Vol.178 No.3 p.352)

1964 There are indications in Great Britain of an abnormally high incidence of lung cancer among asbestosis sufferers and of the development of mesothelioma in some people following short periods of exposure to certain types of asbestos. The Factory Inspectorate considers revision of the 1931 asbestos regulations.
(W.BUCHANAN Asbestosis and Primary Intrathoracic Neoplasms Annals of the New York Academy of Sciences 132 Dec.31,1965)
(L. MICHAELS and S. CHISSICK eds. Asbestos op. cit.)

1964 Warning labels were first placed on asbestos materials in the United States after studies by SELIKOFF showed vastly higher proportions of lung cancer and other lung diseases in individuals who worked with asbestos than in the general population.

Paul KOTIN, senior vice-president for health and environment for Johns-Manville Corp. testified that the pre-1964 studies were not definitive, and that the asbestos companies had no duty to warn insulation workers prior to that time. (H. WEINSTEIN <u>Asbestos Industry Accused of Conspiring to Suppress Warning of Health Hazards</u> Los Angeles Times June 28, 1978 p.8)

1965 "Only in the mid-1960's did the British Ministry of Labour begin consultations designed ultimately to revise the 1931 Asbestos Regulations. In 1965 a special medical advisory panel ... concluded that the American Standard was unsatisfactory, that crocidolite (blue asbestos) was more dangerous than other kinds of asbestos and that fibre-counting was the preferred method of assessing airborne asbestos concentration".

"Their major conclusion was that no 'safe' limit could be established for asbestos." (G.R.C. ATHERLEY <u>Occupational Health and Safety Concepts</u> op. cit. p.297)

1966 Existing standards of dust control were brought into question as evidence accumulated that asbestos was more dangerous than had been thought. In Britain, a detailed country-wide survey was made by Factory Inspectors to find out the effectiveness of dust control methods. There are indications that these inspectors were not in agreement over the needed standards of protection and how they could be achieved. (L. MICHAELS and S. CHISSICK eds. <u>Asbestos</u> Vol. 1 op. cit. p.7)

1966 An Ontario government document showed the Bendix brake manufacturing plant in Windsor, Ontario was ordered to clean up its asbestos operation as early as 1966, but had not done so. "We cannot explain how this happened, nor excuse it", said company spokesman John O'Hare. (L. McQUAIG <u>Occupational Death</u> Maclean's May 19, 1980. p.45).

1968 The Hygiene Standard of Chrysotile Asbestos Dust is published by the British Occupational Hygiene Society (BOHS) based on the concept that so long as there is any airborne chrysotile dust in the work environment there may be some health risk, and that exposure up to certain limits can be tolerated for a lifetime without incurring undue risks of contracting asbestosis.

The limit was set at a maximum concentration of 2 fibres per cubic centimeter over a period of 50 years, or 4 fibres per cubic cm. for 25 years -- at which level the risk of being affected by the dust (to the extent of showing the earliest demonstrable effects on the lung due to asbestos) was believed to be less than 1%.
(L. MICHAELS and S. CHISSICK eds. Asbestos Vol. 1 op. cit.)

The data were derived from one factory processing chrysotile asbestos. "The Hygiene Standard specifically stated there was no known quantitative relation between asbestos and cancer risk, ..."
(G. ATHERLEY Occupational Health and Safety Concepts. op. cit. p.298)

1969 The British Asbestos Regulations (1969) were made under the Factories Act (1961). They were meant to compel the employer to take specified measures to prevent the entry of asbestos dust into the air of the workplace, or else to provide individual protection against its inhalation where such prevention was not possible.
(L. MICHAELS and S. CHISSICK op. cit. p.8)

The 1969 Guidance Note EH/10 (HSE 1976) definition of "fibre" corresponds to that used in the BOHS Standard, - but the BOHS Standard recommend sampling over a full working shift, while The Guidance Note stipulates 10 minutes as a minimum sampling period ... which "represents a weakness in the standard of control".

"According to the Guidance Notes 'ideally the sample should be taken during a period of maximum dust emission so as to determine peak exposure level', but in practice periods of maximum emission may be difficult to detect without extensive sampling - certainly longer than 10 minutes."
(G. ATHERLEY op. cit. p.300)

1969 NEWHOUSE and WAGNER find "considerable discrepancies between the certified cause of death and the pathological conditions revealed at necropsy" during a cohort study of 436 former workers at an asbestos factory.

The additional information obtained from examination of the diseased tissues and from the autopsy reports showed that the incidence of mesothelial tumours was underestimated. Of a further 15 mesotheliomas, 10 mesotheliomas had been attributed either to multiple cancers without mention of a primary tumour or to a cancer of the gastro-intestinal tract.
(Validation of death certificates in asbestos workers Brit. J. Ind. Med. 1969 26 p.302-307)

1970 New York becomes the first city in the U.S. to enact asbestos regulations, which require: that tarpaulins cover areas where asbestos is being sprayed; that waste asbestos is vacuumed and swept into closed containers; and that the containers be buried.
(A Cancer Threat Greater than Cigarettes. Today's Health, July 1970)

1970 Use of sprayed asbestos materials virtually ceased in Ontario in the early 1970's, due to changes in the Construction Safety Act (Section 33), an educational campaign by the Ministry of Labour, and increasing health concerns of the unions.

Most larger buildings with structural steel frames, which were built between the late 1950's and early 1970's and which met the Ontario Building Code requirement for non-combustible construction, may contain sprayed asbestos. (Asbestos in Public Buildings. Occupational Health and Safety Division. Ontario Ministry of Labour March 26, 1980.)

1970s It was company policy until the early 1970's for Johns-Manville not to warn workers if they had danger symptoms of asbestos disease according to W.RUFF, former Pittsburgh, California J-M plant manager. Ruff stated at a Congressional hearing that the company doctor was not allowed to refer workers to outside specialists, even if he found something in his physical examination "that he felt required evaluation by a chest specialist." (Asbestos Firm Hid Workers X-Rays Toronto Star May 3, 1979. L.TATARYN, Dying for a Living, p.30)

1970-74 Over 250 cases of asbestosis were compensated in Quebec. In 1974 alone, 85 workers were so severely damaged by asbestos fibres that they were awarded lifetime indemnities by the Workmen's Compensation Commission. (G. SCHREIBER et al Report of the Asbestosis Working Group, p.23 and L. TATARYN, Dying for a Living, 1979)

1970-75 A Toronto company formulating protective coatings and drywall fillers since 1939 spent five years to develop and test three different joint filler formulas.

The company made it known to government, labour and industry representatives that it would be willing to cooperate and share its "know how" if other companies were interested in obtaining the asbetos-free formulas.

A letter from the company's development manager said: ... "we see no reason that other companies would not be able to exchange asbestos for a safe fibre if asbestos is banned."
(P.LUCAS Letter A&P Lucas Chemical Developments February 25, 1975).

1971 Prior to 1971, under the Ontario Ministry of Health a threshold limit value of 12 fibres per cubic centimeter was in use. The TLV was lowered to 5 fibres/cu.cm. and in 1972 a 2 fibre/cu.cm. TLV was adopted for chrysotile (white) asbestos and a 0.2 fibre/cu.cm. TLV for crocidolite(blue).
(An Overview of the Canadian Asbestos Problem Science Council of Canada. Chemistry in Canada, March 1978)

1972 The asbestos industry (in the U.S.) spent $8.5 million on "research and development", much of it on health matters, compared to the $260,000 spent by NIOSH (National Institute for Occupational Safety and Health).

As the executive director of the Asbestos Information Association noted, "it would be extremely difficult to find a credible researcher in the country whose work in asbestos has not been or is not presently supported, at least in part, by the asbestos industry".
(D. KOTELCHUK Asbestos- Science for Sale Science for the People, September 1975 p.9-11)

1972 Ontario set the standard for exposure to asbestos at 2 fibres per cubic centimeter, then the lowest in North America.
(Hon. Robert ELGIE. Legislature of Ontario Orders November 23, 1978 p.5186)

1974 Asbestos ranked as the 8th most important commodity produced by the Canadian mineral industry, comprising 2.6% of its total output value of $11.7 billion. The country's mining and milling capacity was 1.8 million tons a year with a value of $346 million or approximately 0.2 % of Canada's gross national product. (Mineral Bulletin MR 155: Asbestos Energy, Mines and Resources. Canada Mineral Policy Series 1976.)

1974 D. HAIGH was one of the Canadian doctors who helped examine 1200 Thetford Mines asbestos workers with a team of doctors from the New York Mount Sinai Hospital. He said:

"They were pretty sick people, and some of them were sick and didn't realize it. I met one fellow who had a symptom in his fingernail beds called clubbing, which is a peripheral sign of lung disease. I said to him 'You have clubbing; you're sick; you have lung disease.' He was shocked ... (he) told me 'I thought my fingers were like this because it was hereditary... my father and all my brothers have clubbing'."

"To this man being sick was part of his life. Everybody around him was sick. To him sickness was a natural way of life".

Many of the afflicted workers had recently been given a clear bill of health by the industrial clinic run jointly by the asbestos companies. (L. TATARYN, op. cit. p.25)

1974 On August 20, 59-year-old Emile ST. LAURENT died of asbestosis. On January 12, 1973 the same man had received a "Class A" classification (no disease) from the Thetford Mines industrial clinic run by the asbestos companies in Quebec. His widow said "I still blame the clinic because they gave these regular tests and we learned nothing from them ... He was always fine, classed as 'number one'".

Dr. Paul CARTIER ran the clinic from 1940 to 1974. He openly stated he hadn't always informed workers suffering from asbestosis of the full extent of their illness on humanitarian grounds: "I figured it was in their best interests to stay at their jobs. Besides, they didn't want to be reported ill and transferred to a lower-paying job where they might have earned as much as fifty dollars less a week."
(L. TATARYN Dying for a Living, 1979 p.27-28)

1975 On February 8, the federal government announced that it would establish outdoor emission standards for asbestos plants under the Clean Air Act, administered by Environment Canada. A 2 fibre per cu.cm. standard, to take effect in 1978, was promulgated December 1975.
(An Overview of the Canadian Asbestos Problem loc.cit. p.33)

1975 Blue asbestos (crocidolite) is banned by regulation in the province of Saskatchewan. Labour Minister G. SNYDER:

"We looked at all the evidence and decided not to play the 'numbers game' of TLVs (Threshold Limit Values). While we realize that as a practical matter it is not possible to totally eliminate asbestos fibres without banning asbestos, we strongly believe that the objective should be to reduce fibre counts to the lowest feasible level."
(New Regulations Announced. Saskatchewan Government Information Services Dept. of Labour. March 13, 1975.)

1975 Dr. V. TIDEY of the Ontario Ministry of Health calls for a drastic reduction in the use of blue asbestos, recommending reduction by 90% of allowable levels of blue asbestos in the air - from 2 fibres per cubic centimeter to .2 fibres. (The same limit as Britain's.)

As far as the government could tell, the Canadian Johns-Manville Port Union (Scarborough) plant is the only place in Ontario using blue asbestos. The company said blue asbestos was necessary in producing large transite pipe and no substitute could be used.
(Health Ministry wants to cut blue asbestos air levels by 90% Globe & Mail Spring 1975).

1975 A study of auto brake repair workers found 25% had evidence of X-ray abnormalities consistent with asbestosis; another 25% had restrictive lung function tests.
(W. LORIMER et al. (Asbestos Exposure of Brake Repair Workers in the United States Mt. Sinai Journal of Medicine Vol. 43 No. 3 May-June 1976.)

1975 The National Board of Occupational Safety and Health in Sweden adopted the general principle in the new asbestos regulations of 1975, that asbestos "shall be replaced by less harmful material when possible and shall generally not be used unnecessarily."

Also, the use of "raw asbestos in premises like construction sites, ships, and during building" was forbidden. The spraying of asbestos was banned except when done in closed equipment with exhaust ventilation. The use of crocidolite (blue asbestos) was banned generally. During 1976 the use of asbestos in paints, adhesives, and similar products was banned as was the use of asbestos backing on carpets.
(A.WESTLIN Minimizing the Use of Asbestos in Sweden. National Board of Occupational Safety and Health. Sweden April 11, 1978)

1975 B.CASTLEMAN et al reporting on a Washington DC survey of brake repair shops found 91% of them were "blowing out" brakes with a compressed air hose, and that most of the managers and workers interviewed had never heard about the hazardous potential of brake dust.
(The Hazards of Asbestos for Brake Mechanics. U.S. Public Health Reports Vol.90 No.3)

In Ontario, garage owners who receive "recommendations" from the government were not legally bound to follow them.
(W.KING Personal communication 1978)

1975 A report of the British Parliamentary Commissioner criticized the Factory Inspectorate's attitudes towards its responsibilities in regard to the conditions at an asbestos mill at Hebden Bridge in Yorkshire operated by the Cape Asbestos Co. (1934-1970)

The Commissioner found there was little direct contact between inspectors and the general workforce at the mill. He found that for many years, both employers and Inspectorate were generally unaware of the full extent of the dangers from asbestos dust.

"One might argue that DOLL'S evidence in 1955 provided sufficient corroboration of the findings of LYNCH and SMITH 30 years before, and that a vigorous campaign should have been mounted earlier. That it was not mounted is evidence, I believe, of an attitude of complacency towards asbestos in medical and official circles."
(G. ATHERLEY op. cit. 1978 p.298)

1975-76 The Ontario Workmen's Compensation Board announced in March that lung cancer contracted by asbestos workers would be a compensable disease.

Workers at the United Asbestos Corporation mine and mill at Kirkland Lake Ontario walked off the job to complain of unhealthy working conditions in April; government inspectors visited the mine in September 1975 and June 1976. On the second visit, air samples indicated an average of 12-14 fibres per cu.cm. and the plant was temporarily shut down. The Ontario Ministry of Health in May 1976 announced a program of assistance for asbestos workers suffering from asbestosis. (An Overview of the Canadian Asbestos Problem loc.cit.p.34)

1975-77 Dr.R.MORGAN found that local citizens both on and off the job site at the open pit asbestos mining town of Baie Verte, Newfoundland were exposed to "gross amounts of asbestos fibre". He predicted an excess number of lung cancers. In 1976 the workers were informed of an Environment Canada study which confirmed many of Morgan's observations. (S.LEWIS Mining Town Lives in Fear for Health Toronto Star March 13, 1978)

1976 The Ontario Ministry of Health inspected the Raybestos-Manhattan Peterborough plant. Test samples showed less than two asbestos fibres per cubic centimeter of air -- within the provincial guidelines. However, the testing was done when the brake lining factory was operating only about 50 per cent of the equipment.

The Ministry claimed that if a worker is found to have a disease, his doctor or the company's doctor is informed. The Ministry does not tell the worker himself. (S. GAGE Local 5141 Steelworkers still fear health hazard at Raybestos-Manhattan Steel Labour. Jan. 1976)

1976 Philip MALOUF, Chairman of the Board of United Asbestos Inc. mine and mill operation (near Matachewan, west of Kirkland Lake, Ontario) said on a radio program: there is no danger in working with asbestos ... no one has ever died from asbestos exposure.
(Information pamphlet cites asbestos hazard. Globe and Mail. April 16, 1976).

1976 Letter from asbestos worker Paul FORMBY to author L. Tataryn:

"The experience of all of us who have questioned safety in the asbestos industry has been that the McGill (University) studies were used ... to further the interests of the asbestos industry ... (and) to minimize concern for the hazard before the general public, and the workers." "...it is certain, at least in my mind, that the industry used [Dr. Corbett] McDONALD to further their interest. McDonald certainly never publicly criticized the industry for using his studies."
(May 17, 1976 in L. TATARYN op. cit.)

1976 The Ontario Workmen's Compensation Board accepts cancer of the stomach and intestines in workers exposed to asbestos as an industrial disease. To qualify for compensation or pension, a worker has to have at least 20 years continuous exposure to asbestos.
(WCB recognizes stomach cancer from asbestos Globe and Mail, October 26, 1976)

1976 "Evidence exists showing substantial levels of exposure still existing in the mines and mills of Canada. Presently, the total risk group (in mines & mills) is approximately 6,550."

"It is clear that under-reporting of asbestosis cases occurs ... surveillance programs are inadequate for all occupational groups and some provinces have not acknowledged or recognized possible asbestos health hazards."

"Definite health hazards exist in the Canadian workplace due to high levels of occupational exposure together with inadequate health surveillance and protection."
(G. SCHREIBER et al. Report of the Asbestosis Working Group Environmental Health Directorate Health and Welfare Canada 1976.)

1976 Judge Rene BEAUDRY, head of a provincial government commission looking into asbestos in Quebec, said:
"We consider it shocking that in 1976 certain employers still force their workers to handle asbestos fibres with their hands."
Beaudry said the companies had done little to alleviate dangers posed by asbestos dust. The interim report of the Beaudry inquiry also said that asbestos companies intentionally keep "available information about the dangerous effects of exposure to asbestos dust away from the workers and the unions."

Medical researchers told the commission that 75% of all workers who had been in the asbestos industry for 20 years had lung abnormalities, and the lung cancer rate among such workers was 4 times the expected.
(Montreal Times, April 12, 1976)and(Inquiry finds Quebec asbestos mine conditions "inconceivable" The Miners' Voice, October 1976) and (Report No.41, Science Council of Canada October 1977)

1977 "What annoys me is that most of the workers on the floor have never been told about the dangers of breathing asbestos fibres" - John DONALDSON, an ironworker on the Toronto airport Terminal 1 construction site, where about 55 tradesmen were working during stripping of asbestos lagging from steel beams. According to Mr. Donaldson, government inspectors tested the air at the site for only 30 minutes in relatively clean areas; then six weeks later the workers still had not been given the results.
(V. MALAREK Asbestos Dust Levels Called Hazardous to Workers at Airport Building Site. The Globe & Mail March 23, 1977).

1977 A Science Council of Canada report warned that "any individual who lives in the vicinity of asbestos mining or who works with asbestos in any form is at risk".
(Policies and Poisons. Science Council of Canada Report No. 28 October 1977)

1977 "Under the Hazardous Products Act (Canada - amended 1973, 1975 and 1976)), advertising, selling, or impórting toys or clothing products containing asbestos is prohibited unless the product is designed as protection from fire or heat, or is constructed so that asbestos fibres will not become separated from the product. Also prohibited are products that are composed of or contain any type of asbestos and that are used in modelling or sculpture...or are for use by children and made in such a way that asbestos may become separated from the products."
(R.FRANSON Canadian Law and the Control of Exposure to Hazards Science Council of Canada Study No.39 October 1977 p.35)

1977 Ontario Health Minister Bette STEPHENSON admitted there was a needlessly long delay on the part of government officials in taking steps to control asbestos levels at Royal Industries - Certified Automotive Products in Rexdale, Ontario. (Slow to report air test results, province admits. Toronto Star. November 4, 1977).

Levels as high as 55 fibres per cubic cm. of asbestos were recorded on May 26 at Royal Industries. (Floyd LAUGHREN Legislature of Ontario. Orders p.2205 November 24, 1977).

1977 "Our studies (Ministry of Labour) in Ontario would seem to indicate that the industry is well able to bear significantly increased costs without enormous dislocations in the industry...[and] that our asbestos-using industries are ...capable of working under the necessary constraints imposed upon them." (G.RAJHANS Here's an Update on Asbestos Occupational Health Engineering Services, Ministry of Labour Ontario Nov./Dec.1977)

1977 At Baie Verte, Newfoundland a study team headed by SELIKOFF is alleged to have recorded the highest airborne dust level found outside an asbestos plant--14,000 nanograms of asbestos per cubic metre of air.
Selikoff found 50 of the 485 Baie Verte miners to have X-ray abnormalities indicative of asbestosis, and 31% of those who worked the longest showed abnormality. He found one-third of the wives and children tested also had abnormal X-rays.
(Risk noted in asbestos dust (CP) Hamilton Spectator. Dec. 12, 1977)

1978	Eugene GILBERTSON of Ladysmith, British Columbia finally settled a compensation claim with the Saskatchewan Worker's Compensation Board after a five-year tangle. The 43-year-old electrician worked only 11 months around asbestos-covered pipes and boilers at the Saskatchewan Power Corp., but 20 years later he was dying of asbestos-related cancer. Gilbertson received only 20 per cent compensation from the board. His cancer was originally diagnosed as "the flu" and later thought to be pleurisy. (<u>Dying Man hopes WCB gets hopping</u> (CP) Hamilton Spectator Jan. 13, 1978)
1978	"One of the Parti Quebecois administration's promises is to increase secondary processing of asbestos fibre from the province's mines." ..."The provincial natural resources department would like to see how much asbestos can be used in building the proposed $60 million convention centre in Montreal." (<u>Use of Asbestos in Building Urged</u> (CP) Feb.20, 1978) In one section of an Asbestos Corp.Ltd. mill (No.2) at Black Lake, Quebec the dust levels were so high that inspectors were unable to take samples. In other areas the average fibre counts were 40.9, 63.9 and 43.1 fibres per cubic centimeter. The rock storage area had the highest levels, with one sample measuring 99.11 fibres per cubic centimeter. (<u>High Asbestos Fibre Levels Found in Mill Quebec Proposes to Buy</u> March 9,1978)

1978 "The Centrale des Syndicats Democratique, the workers union at Johns-Manville, printed a booklet demanding that the government of Quebec take action to force the province to use more asbestos. The Conseil de Developpement des Cantons de l'est advocates nationalizing asbestos and producing more of it. ... There is no voice in Quebec that is opposed to the existence of asbestos on the marketplace."
(R.DAWSON Quebec to Nationalize Asbestos Cancer The Townships Sun April 1978)

1978 Cassiar Asbestos Corporation in British Columbia rejects a warning , that even brief exposure to asbestos dust may lead to lung cancer and other fatal diseases. P.STEEN, president of Cassiar, says asbestos is harmful only if inhaled in large quantities over a long period.
(Asbestos firm rejects lung cancer warning (CP) Hamilton Spectator April 27,1978)

1978 One of the 510 Baie Verte, Newfoundland asbestos workers recalls that the miners were so unaware of the hazards that they used to throw each other playfully into the piles of feather-like asbestos. The management of the Advocate Mines Ltd.(J-M) operation never gave any indication that this was dangerous.
(S. MARTLAND Miners Fighting for Their Lives Atlantic Issues:Oxfam Vol.2 No.3)

1978 A nation-wide warning was issued by U.S. Health, Education and Welfare Secretary J. CALIFANO, predicting that 51% of the millions of people who had worked with asbestos during and after World War II would die of lung cancer or other diseases as a result of that exposure.
(L.MARTIN Asbestos workers not told of hazards, papers indicate. Globe and Mail, November 23, 1978)

1978 DR. E. SOMERS of the federal Environmental Health Directorate issued a warning on asbestos to all doctors in the Canadian Medical Association, asking them to make regular enquiries about their patients' occupational history. He said 10,000 Canadians are estimated to have worked in the shipbuilding industry during the Second World War when asbestos was used on ships.
(MDs get warning to check patients for asbestos risk Ottawa (CP) Hamilton Spectator Dec. 2, 1978)

1978 B. CASTLEMAN says that asbestos firms, such as Raybestos-Manhattan Corp., are considering moving to Mexico, Taiwan, or South Korea, where worker exposure to asbestos is without legal restriction.
(The Export of Hazardous Factories, Washington DC, 1978)

1978 The independent medical researchers who wrote about the hazards, while reflecting a "humane concern for the afflicted workers", generally buried their findings in technical publications, inaccessible to the general reader.
(D. BERMAN. Death on the Job Monthly Review Press. New York 1978)

1978 P. SEBASTIEN et al present findings on indoor asbestos air pollution, notably:

-- All buildings using "accessible" spray in their construction were polluted; contact between sprayed surface and ambient air was associated with polluted situations in 76% of cases.

-- The type and extent of human activity within the building has a very significant influence on the generation of indoor pollution; the greater the activity the higher the levels of asbestos in the air.
(Levels of Asbestos Air Pollution in Some Environmental Circumstances Dept. de Recherches sur les Affections Respiratoires et l'Environnement. Paris 1973.)

1979 Asbestos-free brake linings made by Paton Brake Replacements (Australia) are available for disc brakes on practically all types of cars. General Motors has asbestos-free brake blocks available for all small vehicles and light pick up trucks. The National Swedish Board of Industrial Safety tested them and found they do not contain any hazardous substances. One type is a semi-metallic rigid moulded material.
(IMF International Metalworkers' Federation Bulletin on Occupational Health and Safety Special Issue on Asbestos No. 5, Aug.)

1979 The British Advisory Committee on Asbestos recommends new "safety" levels for exposure to the three main types of asbestos:

-- for crocidolite (blue asbestos) it recommends 0.2 fibres/ml. of air breathed; for amosite (brown) a limit of 0.5 fibres/ml. and for chrysotile (white) a limit of 1 fibre per ml.

The committee emphasized that these limits are not "safety levels". It accepts there is no threshold below which cancer-causing substances such as asbestos have no effect. The suggested standards are called "control limits".
(R. LEWIN Tighten controls on asbestos recommended New Scientist Sept. 13, 1979)

1980 "We requested the production of documents from Bell Asbestos Lines Ltd. of Canada, which shipped and supplied asbestos for use at the Johns-Manville plant at Lompoc, California. Bell refused to produce any documentation, claiming that to do so would place it in violation of Chapter 278 of the 1964 revised Statutes of Quebec, Business Concerns Records Act, which is the law in the Province of Quebec."
(Statement of Steven KAZAN loc. cit. March 24, 1980)

1980 "Existing guidelines for controlling exposure to asbestos in the occupational setting have been developed to control asbestosis, rather than cancer. Most environmental limits have been based on extrapolations from this data ..." "There is currently no scientific basis for establishing any level of exposure as an acceptable guideline." (Asbestos in Public Buildings Occupational Health and Safety Division, Ontario Ministry of Labour. March 26, 1980.)

1980 A Ministry of Labour survey of companies which have applied sprayed fireproofing in Ontario indicated there may be 920 to 1250 buildings in the province containing sprayed asbestos materials.

Virtually all of these buildings use the air space above the false ceiling as the return air plenum for the ventilation system; loose sprayed asbestos material in this space may be circulated through the ventilation system and into the air. (Asbestos in Public Buildings Occupational Health and Safety Division Ont. Ministry of Labour March 26, 1980.)

1980 R.STEWART, executive director of the Canadian Chemical Workers Union, criticized the federal manpower department for referring workers to companies where asbestos is used, stating that by doing so and failing to inform workers of the potential hazard, the government is lending support to the situation. R.WHITE, United Auto Workers director for Canada, accused the Ontario provincial government of complicity in the Johns-Manville deaths. (Investigation, tighter standards sought Canadian Occupational Health and Safety News Vol.3 No.8 April 14, 1980)

1980 Johns-Manville Canada Inc. shut down its asbestos-cement pipe-making operations in Scarborough, Ontario May 23. One of the 173 workers who lost their jobs said the company "has made us into lepers no other employer will touch." Over 50 workers of a total 500 at the Scarborough J-M plant have been disabled by chronic respiratory diseases, and there have been about 43 deaths from lung cancer.
(Firm made us lepers,worker says Toronto Star May 24, 1980)

1980 A Los Angeles Superior Court jury ordered two asbestos manufacturers to pay $1.2 million in damages to a former shipyard worker who said he had developed asbestosis from inhaling asbestos fibres. The damages were assessed against Johns-Manville Corp. and Raybestos-Manhattan Inc., defendents in most of the more than 1,000 similar suits pending in L.A. and across the United States.
($1.2 Million Awarded to Plaintiff in Asbestos Suit Los Angeles Times May 28,1980)

1980 For every fibre of asbestos found in the air greater than 5 microns in length, it is estimated there are 100 shorter, less visible, more dangerous fibres. The average person breathes in 8 million cc.(or 8 cubic metres)of air in an 8-hour day. "Thus the occupational guideline permits the breathing of 1.6 billion fibres in an average workday; even at the environmental guideline 32 million fibres would enter the lungs every eight hours."
(Environmental Asbestos At the Source , Ontario Federal of Labour May/June 1980)

1980 The Toronto Hydro Electric Commission is starting a program to rid the city's 5,000 manholes of hazardous asbestos insulation. Tests done over the summer found asbestos particles from electric underground cables "a fairly high health hazard" to manhole workers.
(Hydro working in dark to clean up asbestos Globe & Mail October 7, 1980)

1981 Tommy DUNN, a 35-year-old man who had worked for only 12 years in the welding department of the Windsor Bendix Corp. auto brake plant in Windsor Ontario, died of mesothelioma on January 3. The cases of 19 of the Bendix workers have been taken by the United Auto Workers to the Workmen's Compensation Board; 13 of the 19 have died of asbestos-related diseases.
(35-year-old employee of Bendix becomes 13th victim of asbestos Globe & Mail Jan.6,1981).

Canadian Environmental Law Association
L'Association canadienne du droit de l'environnement

8 York Street, 5th Floor South, Toronto, Ontario M5J 1R2, telephone (416) 366-9717

85

S U B M I S S I O N B Y

THE CANADIAN ENVIRONMENTAL LAW ASSOCIATION

TO

THE ROYAL COMMISSION ON MATTERS OF
HEALTH AND SAFETY ARISING FROM THE
USE OF ASBESTOS IN ONTARIO

February 17, 1981

T A B L E O F C O N T E N T S

SUBMISSION BY THE CANADIAN ENVIRONMENTAL LAW ASSOCIATION
TO THE ROYAL COMMISSION ON MATTERS OF HEALTH AND SAFETY
ARISING FROM THE USE OF ASBESTOS IN ONTARIO

1. INTRODUCTION

The Canadian Environmental Law Association, founded in 1970, is a public interest environmental law group committed to the enforcement and improvement of environmental laws. Because of our increasing general involvement in toxic substances cases, CELA has followed with interest the problems respecting adverse health effects to workers and the general public resulting from society's continued use of asbestos. We are therefore pleased to have an opportunity to make an oral presentation to this Commission. Our presentation will be directed towards what the Commission has termed in its brochure "Institutional and Policy Issues".

Previously, we have made submissions to the Ontario Ministry of Labour on their proposed Designated Substances Regulations under The Occupational Health and Safety Act, 1978, one of the proposed designated substances being asbestos. A copy of our latest submission dated November 26, 1980 is attached as Appendix A for the information of the Commission.

II. A BRIEF DESCRIPTION OF ASBESTOS[1]

Asbestos is the common name for a number of naturally occurring, fibrous mineral silicates that have a crystalline structure and are incombustible in air. There are four main types of asbestos, all of which are physically and chemically different and which have therefore different specific uses. These four types are:

(a) Chrysotile, which is mined mainly in Canada, Russia, and Zimbabwe, has fine silky flexible white fibres and is often referred to as "white asbestos";

(b) Crocidolite, which is found mainly in South Africa, Western Australia and Bolivia, has straight fibres and is often referred to as "blue asbestos";

(c) Amosite, which is found mainly in South Africa, has straight brittle fibres and is light grey to pale brown in colour; and

(d) Anthophyllite, which is mined in Finland and Africa, has brittle white fibres.

Other types of asbestos are tremolite and actinolite.

The six types of asbestos fall into two groups, serpentines and amphiboles. Chrysotile, which is by far the most abundant type of asbestos found, is the only species in the serpentine group.

III. THE USES OF ASBESTOS[2]

Although asbestos has been used in small quantities for literally thousands of years, it was not until the latter part of the nineteenth century that it began to be used widely. Extensive mining operations commenced in Quebec in 1878, in Russia in 1885 and in South Africa in 1906.

Asbestos has achieved wide-spread use because its special physical and chemical properities make it virtually indestructible. It is resistant to chemicals, particularly acids, and to fire; it has mechanical strength and a high length to diameter ratio; it is flexible and has good friction and wear characteristics. It has been described as the "fire safe" and "magic mineral".

Some 3000 uses for asbestos have been recorded to date. Approximately 2/3 of these uses are in the construction industry, including asbestos cement, sheet and pipe, and asbestos flooring and roofing products. Other uses include: electrical and thermal asbestos insulation materials, asbestos friction products, specialized asbestos bearings and asbestos textiles.

In some applications, such as in for example asbestos cement, asbestos fibres are bound in a matrix form or are encapsulated. In other applications, such as in asbestos fireproofing spray (which was used extensively in the 1960's in high rise buildings), the fibres are "friable" and essentially free.

IV. ASBESTOS AS A HEALTH HAZARD

1. Occupational Exposure[3]

Within approximately 20 years of the first large-scale mining of asbestos, adverse health effects associated with occupational exposure to asbestos were becoming apparent. In France, between 1890 and 1895, 16 out of 17 workers in an asbestos weaving factory died. In the United Kingdom, by 1899, 11 workers in an asbestos spinning factory had died at about age 30. The death of the last of the 11 workers was the first recorded case of the asbestos-related disease which was later to become known as asbestosis.

It has now been well established by epidemiological studies that occupational exposure can result in one or more of the following diseases:

(a) a non-malignant, progressive, irreversible form of pulmonary fibrosis known as asbestosis, which results from inhalation into the lungs of very small particles of asbestos dust which cause the formation of scar tissue;

(b) a rapidly progressive and terminal mesothelioma, a malignant tumour of the membrane lining of the chest or abdomen (this type of cancer, which has a very long latency period and which may result from only a brief exposure to asbestos, is extremely rare in members of the general public and is believed to result from the penetration of the membrane lining by fibres, particularly those fibres that are straight in form, such as "blue asbestos" fibres;

(c) a crippling cancer of the lungs, larynx or gastrointestinal tract.

2. Non-Occupational (Environmental) Exposure[4]

Because asbestos is virtually indestructible, it persists in the environment and can be distributed by both natural and man-made forces. Thus people not employed in asbestos-related occupations may be exposed to asbestos fibres. Such fibres may be inhaled, as in

an office building in which the air has been contaminated by fibres from asbestos insulating materials, or ingested with food, water or drugs.

William J. Nicholson, of the Mount Sinai School of Medicine of the City University of New York, in a paper attached as Appendix B entitled "Regulatory Actions and Experiences in Controlling Exposure to Asbestos in the United States", which was delivered to a June 28-30, 1979 international conference on "Public Control of Environmental Health Hazards" sponsored by The New York Academy of Sciences, describes two studies of adverse health effects resulting from non-occupational exposure to asbestos. One study, by Wagner et al, in 1960, associated mesothelioma "with environmental asbestos exposure"[5] while the other study, by Anderson et al. in 1976, reported on "abnormal x-rays characteristic of asbestos exposure...in...family contacts of asbestos workers".[6]

The Wagner study[7] examined 16 new cases of mesothelioma in South Africa. 6 of these cases were in asbestos mine workers, while the other 10 were in people who had lived in the vicinity of asbestos mines, many as children.

Since then, there have been reports[8] of non-occupational mesotheliomas from 9 other countries, including the United States. It is believed that these cases are due to exposure of family members to asbestos brought home on the clothes of asbestos workers.

Further sources of environmental exposure to asbestos result from contamination of air and drinking water with asbestos fibres. With respect to the former, "(h)igh concentrations of asbestos have recently been demonstrated in communities adjacent to asbestos industries".[9]

With respect to the latter (contamination of drinking water with asbestos fibres), a major source of asbestos in the Great Lakes Basin is the Reserve Mining Company operation at Silver Bay in Lake Superior.[10] Reserve has for many years dumped near Duluth, Minnesota mine wastes containing a high concentration of asbestos fibres.

In April 1974, United States Federal District Court Judge Miles Lord granted an injunction, on health damage grounds, prohibiting Reserve from further dumping of its mine wastes into Lake Superior. However, a Federal Appeals Court reversed the decision of Judge Lord, notwithstanding that it was unknown whether the contamination of Lake Superior waters with asbestos would result in an increase in the cancer rate in people using the waters as a source of drinking water.

Subsequent to the decision of Judge Lord, the Great Lakes Research Advisory Board reported[11] to The International Joint Commission in February 1975 that background levels of asbestos in the waters of the Great Lakes varied generally from 1 to 10 million fibres per litre, although in the vicinity of Silver Bay the level was approximately 250 million fibres per litre.

V. REGULATORY ACTIONS IN CONTROLLING EXPOSURE TO ASBESTOS

Nicholson (Appendix B) has concluded that "(t)he history of efforts to control human exposure to asbestos has not been an auspicious one" and that "...there has been little for which to congratulate ourselves".[12]

For example, a 1907 British government report stated: "One hears, generally speaking, that considerable trouble is now taken to prevent the inhalation of dust so that the disease pulmonary fibrosis is not so likely to occur as heretofore".[13] Similarly, a 1930 British government report commented optimistcally: "The outlook is...good...In the space of a decade or thereabouts the effects of energetic application of preventive measures should be apparent in a great reduction of the incidence of fibrosis".[14] As events have since shown, such unbridled optimism was unwarranted.

1. Current and Proposed Ontario Guidelines - Occupational Exposure

The current Ministry of Labour guidelines for occupational exposure to asbestos are:[15]

(a) for chrysotile, 2 fibres per cubic centimetre of air (2 f/cc); and

(b) for amphiboles, ·2 f/cc of air.

The guidelines are limited to fibres having a length greater than 5 microns.

However, on August 16, 1980, the Ministry of Labour published in the Ontario Gazette[16] a proposed Regulation under The Occupational Health and Safety Act, 1978[17] for asbestos (see Appendix A for a copy of our submission to the Ministry regarding this Regulation, among others). The Regulation, which is restricted to fibres longer than 5 microns,[18] proposes the following limit, based on a time-weighed average exposure of a worker:[19]

(a) for amosite, 0.5 f/cc of air;

(b) for crocidolite, 0.2 f/cc of air; and

(c) for chrysotile or any other asbestos except amosite and crocidolite, 1.0 f/cc of air.

and the following limit, based on exposure of a worker in any period of time:[20]

(a) for amosite and crocidolite, 2.0 f/cc of air; and

(b) for chrysotile or any other asbestos except amosite and crocidolite, 5.0 f/cc of air.

2. Current Ontario Ambient Air Quality Guideline - Non-Occupational (Environmental) Exposure

The Ontario Ambient Air Quality Guideline[21] is 0.04 f/cm^3 (for fibres longer than 5 microns) averaged over 24 hours.

3. Current Ontario Design Emission Guideline - Non-Occupational (Environmental) Exposure

The Design Emission Guideline[22] is 5 ug/m^3 for all fibre lengths averaged over 30 minutes.

4. Current Federal Ambient Air Standards for Emissions at Mines and Mills - Non-Occupational (Environmental) Exposure

The Environment Canada emission standard promulgated in 1978 under the federal Clean Air Act[23], for emissions from mining and milling operations is 2 f/cm^3 [24] (for fibres longer than 5 microns).

5. Current Federal Regulation Relating to Asbestos in Toys and Modelling Materials

A 1975 Regulation[25] made under the federal Hazardous Products Act[26] bans products containing asbestos fibres and from which the fibres can be released.

6. Placement of Asbestos in Category 2 Review Under the Federal Environmental Contaminants Act

While there are no regulations restricting asbestos manufacture distribution or use pursuant to the federal Environmental Contaminants Act[27], in 1977, the substance was placed in a category 2 review group by Environment Canada. Under this category, substances which the government "has reason to believe pose a significant danger to the environment or human health" are to be investigated in depth to determine the nature and extent of the danger and the means to alleviate that danger. No review has been carried out by Environment Canada, although the National Research Council of Canada did in 1979 publish a report entitled "Effects of Asbestos in the Canadian Environment".

VI. WEAKNESSES AND DEFICIENCIES IN THE EXISTING REGULATORY FRAMEWORK

1. Occupational Exposure

There are at least two main areas of concern. First, the current Ministry of Labour guidelines, as well as the exposure limits in the proposed Regulation, overlook fibres less than 5 microns in length. Some experts consider these short fibres to be more harmful than longer fibres because of their tendency to pass into the human lymph and blood systems.[28]

Secondly, the exposure limits in the proposed Regulation may not be strict enough to prevent malignancies. Recent evidence indicates that the dose-response curve for exposure to asbestos is linear and not S-shaped as previously assumed, and that therefore there is no safe exposure limit.[29]

In the United States, a joint National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Association (OSHA) working group in April 1980 confirmed[30] that there is no safe exposure limit, and that exposure to any type of asbestos can result in adverse health effects. Consequently, the working group recommended that substitutes for asbestos be used whenever possible so that non-essential uses could be eliminated, and that the limit for occupational exposure to any type of asbestos be reduced to .1 f/cc, this figure being the lowest reliable detection limit.

2. Non-Occupational (Environmental) Exposure

Few jurisdictions have established limits for environmental exposure to asbestos. Of those that have, most are restricted to limiting emissions from sources to protect neighbouring residents from asbestosis.[31] These limits are not generally speaking directed towards preventing malignancies resulting from exposure to asbestos.[32] In the United States, for example, the Environmental Protection Agency has promulgated an emission standard prohibiting "visible emission" of asbestos from various operations.[33]

The Ontario Ministry of Labour has given a number of reasons to explain the problems inherent in developing appropriate standards for asbestos in ambient air, including:[34]

(a) the lack of a firm basis for extrapolating from occupational exposure limits to environmental limits for asbestos in ambient air;

(b) the uncertainty of the Occupational Exposure limits;

(c) the lack of suitable dose-response data respecting the incidence of mesothelioma following exposure to asbestos; and

(d) the lack of knowledge of a safe exposure limit.

These reasons may no longer be valid and must be reconsidered in view of the previously mentioned NIOSH/OSHA Report confirming that there is in fact no safe exposure limit.

It is therefore essential that Regulations be enacted in Ontario under the province's Environmental Protection Act, 1971[35] establishing very strict standards relating to the emission of asbestos to the air and land environments from all sources. Similarly, it is essential that Regulations be enacted under The Ontario Water Resources Act[36] establishing very strict standards relating to the emission of asbestos to the water environment from all sources. Before such Regulations are enacted, they should be published in draft form and the public given a full opportunity to comment on them.

Part V of The Environmental Protection Act, 1971 relates to "waste management". Under this Part, the operation of a waste disposal site or a waste management system requires a cer ificate of approval from the Director of Approvals.[37] It is our understanding that the Director does not treat the dumping of inert fill as a waste requiring approvals. However, construction debris which is dumped, for example, in Toronto Harbour at the Leslie Street spit is contaminated with asbestos. The Ministry of the Environment has not treated such an operation as a waste disposal site, and moreover, does not test the debris for levels of asbestos. Thus there is in this instance no control on the disposal to the aquatic environment of asbestos contaminated materials.

Part VIII-A of The Environmental Protection Act, 1971, which relates to"spills", was enacted in December 1979 and is intended to make the owners and handlers of toxic substances responsible for, among other things, reimbursing victims of spills for property damage and financial losses. However, this Part has never been proclaimed. Moreover, Regulations, under this Part, setting up a corporation to compensate victims, have not yet been promulgated. Before they are promulgated, the public must be given a full opportunity to comment on them.

As a matter of policy, victims of pollution (including those suffering asbestos-caused damage) should be compensated for all losses including health damage. It is arguable however, whether Part VIII-A of the Act covers the emission of contaminants that are not abnormal or out of the ordinary or otherwise allowed by permit or regulation. The Act should therefore be amended to clarify that victims suffering from the effects of pollution, such as from asbestos, are to be compensated.

VII. SUBSTITUTES FOR ASBESTOS

The NIOSH/OSHA working group recommended that substitutes for asbestos be used whenever possible.

VIII. RECOMMENDATIONS

1. Because mesothelioma may result from only a brief exposure to asbestos and there likely is not a safe exposure limit, it is clear that exposure, both from an occupational and non-occupational perspective, must be prevented. Therefore, the NIOSH/OSHA recommended occupational exposure limit of 0.1 f/cc should be adopted. Furthermore, stricter limits should be promulgated as detection instruments become more sensitive.

2. As well, substitutes for asbestos should be used whenever and wherever possible. Before substitutes are used, however, it will be prudent to determine whether the suggested replacement itself constitutes a health hazard.

3. If it is established that it is essential that asbestos be used in the future in a particular application, then it should be used in an encapsulated environment to prevent escape. In other words, the system in which it is used should be closed.

4. Non-essential existing applications of asbestos should be discontinued and the asbestos removed and disposed.

5. Asbestos contaminated materials should be disposed of in approved waste disposal sites whiere there is no possibility that the asbestos fibres will reach ground or surface water flow regimes, and where there is no possiblity that the fibres will be dispersed by wind action.

6. Part VIII-A of The Environmental Protection Act, 1971 should be proclaimed and regulations extablishing a corporation to fund victims of pollution established. Part VIII-A should be amended to make it clear that victims of any form of pollution, and not just of spills, are to be compensated.

7. Before any regulations are promulgated, the public must be given a full opportunity to participate completely in the regulation setting process.

IX. FOOTNOTES

1. Asbestos: Properties, Applications and Hazards (Volume 1), Michaels, L. and Chissick, S.S. (Editors), New York:John Wiley and Sons Ltd, 1979. Note particularly the Introduction section by the Editors.

2. Ibid.

3. Ibid.

4. See generally reference 1, including chapter 5, "Non-Occupational Asbestos Emissions and Exposures" by B.E. Suta and R.J. Levine, pp.171-205.

5. "Regulatory Actions and Experiences in Controlling Exposure to Asbestos in the United States" by W.J. Nicholson, in Public Control of Environmental Health Hazards, E.C. Hammond and I.J. Selikoff (Editors), New York: The New York Academy of Sciences, 1979, pp.293-303 at p.205.

6. Supra, footnote 5, p.297.

7. The Wagner study is discussed briefly by Epstein in The Politics of Cancer at p.96.

8. Supra, footnote 7, pp.96-97.

9. Supra, footnote 7, p.97.

10. Supra, footnote 7, pp.97-98.

11. "Asbestos in the Great Lakes Basin", a report to The International Joint Commission from The Great Lakes Research Advisory Board, February 1975.

12. Supra, footnote 5, p.293.

13. Ibid.

14. Ibid.

15. "Asbestos in Public Buildings", Ontario Ministry of Labour, Occupational Health and Safety Division, March 26, 1980, Table of Asbestos Exposure Limits.

16. Volume 113-33, pp.3339-3348.

17. S.O. 1978, c.83.

18. Supra, footnote 16, p.3339, section 1.

19. Supra, footnote 16, pp.3339-3340, Section 4.

20. Ibid.

21. Supra, footnote 15.

22. Ibid.

23. S.C. 1970-71-72, c.47.

24. Supra, footnote 15.

25. The Regulation is referred to in Effects of Asbestos in the Canadian Environment, National Research Council of Canada, No. 16452, 1979, at p.57.

26. R.S.C. 1970, c.H-3

27. S.C. 1974-75-76, c.72.

28. "The Asbestos Battle" by George A. Peters, Trial, December 1980, pp.56-58.

29. United States Department of Health, Education and Welfare, and United States Department of Labour, "Workplace Exposure to Asbestos: Review and Recommendations", NIOSH-OSHA Work Group, April 1980.

30. Ibid.

31. Supra, footnote 15, at p.41.

32. Ibid.

33. Supra, footnote 15.

34. Supra, footnote 15, at p.4.1

35. S.O. 1971, c.86, as amended.

36. R.S.O. 1970, c.332, as amended.

37. Supra, footnote 35, s.31.

APPENDIX A

Canadian Environmental Law Association
L'Association canadienne du droit de l'environnement

8 York Street, 5th Floor South, Toronto, Ontario M5J 1R2, telephone (416) 366-9717

SUBMISSION BY

THE CANADIAN ENVIRONMENTAL LAW ASSOCIATION

ON THE

PROPOSED DESIGNATED SUBSTANCES REGULATIONS

UNDER

THE OCCUPATIONAL HEALTH AND SAFETY ACT, 1978

TO

DESIGNATED SUBSTANCES PROJECT

STANDARDS AND PROGRAMS

MINISTRY OF LABOUR

400 UNIVERSITY AVENUE

TORONTO, ONTARIO

M7A 1T1

Presented by

MICHAEL IZUMI NASH

BARRISTER & SOLICITOR

CELA ADVISORY BOARD OF DIRECTORS

NOVEMBER 26TH, 1980

TABLE OF CONTENTS

SUBMISSION BY THE CANADIAN ENVIRONMENTAL LAW ASSOCIATION
ON THE PROPOSED DESIGNATED SUBSTANCES REGULATIONS
UNDER THE OCCUPATIONAL HEALTH AND SAFETY ACT, 1978

I. INTRODUCTION

The Canadian Environmental Law Association, founded in 1970, is a public interest environmental law group committed to the enforcement and improvement of environmental laws. We have previously made submissions to the Ministry of Labour in October 1978 on the then proposed Regulation respecting General Occupational Health Hazards and the proposed Regulations Respecting Lead, Asbestos and Silica.

CELA is pleased to be able to put its comments on the proposed Designated Substances Regulations (Gazette, August 16th, 1980) to the Minister of Labour through the Designated Substances Project. In doing so, we hope to bring to bear the expertise and viewpoints of those whose demonstrated concern is for the development of effective legal regimes to improve the environment, including the work environment.

II. MEDICAL MONITORING, EXPOSURE LEVELS AND REMOVAL FROM EMPLOYMENT

A. General

The Ministry did not formally publish a Statement of its own rationale or supporting data for the Designated Substances Regulations ("the Regulations"). In the absence of such a Statement, it would appear that the general thrust of the Regulations is as follows: to set exposure standards sufficiently low that excessive numbers of employees should not contract an industrial disease; to require a rigorous system of medical monitoring of employees to detect actual or potential industrial diseases even given the low exposure standards; and to remove employees from

exposure which is producing or has produced an industrial disease. The rigours of the proposed medical monitoring program express the inevitable fact that employees will continue to be at risk even when the arithmetically expressed criteria of the Regulations are met. The result is that employees will be subject to frequent periodic medical examinations, often including x-rays[1], that may themselves impair health. They will still be subject to contracting the particular industrial diseases associated with a given designated substance. And finally, they will be subject to removal from employment with all the attendant dislocation and disruption that that entails.

CELA queries whether the Regulations are, in fact, adopting exposure criteria which are sufficiently low. If the sophisticated and frequent examinations proposed are necessary, it is legitimate to question whether the criteria could not be set at a lower level.

Even if the exposure criteria proposed in the draft Regulations are finally adopted, it is still open to require an additional obligation: that no exposure be permitted beyond the lowest level that is then feasible. Feasibility might be defined in the same way the Regulations do in relation to criteria for the permitting of respiratory equipment, namely, that feasibility is a question of available existing technology.

By importing this additional obligation the Regulations would be adopting a limited self-correcting feature to take into account advances in technology. The self-correcting feature might well have the effect of decreasing exposure to workers who might otherwise be unnecessarily exposed while the regulatory process took its course. In terms of achieving certainty, there is no substitute for arithmetically expressed ceilings; but, in terms of achieving maximum prevention of industrial disease it would be well worth attempting to put in place a downward flexible ceiling.

Nothing would prevent the Ministry from promulgating new arithmetic ceilings in response to new technology, but while the process was underway employees could enjoy the benefits of that technology. It should also be clear in the regulations that collective bargaining agreements may require stricter standards than those established under these regulations.[2]

B. Removal From Exposure: Permissive vs. Mandatory Requirements

Two of the draft requirements are permissive with respect to the ability of an employer to remove an employee from exposure (asbestos and silica) and four are mandatory (lead, mercury, isocyanates and vinyl chloride). If removal requires job relocation, presumably the preventive rehabilitation policies of the Workmen's Compensation Board[3] will ease the economic burden.

We appreciate that the regulations apply to substances whose toxicity, latency period, and certainty of prognosis differ. But we do not see why protection by removal should be any less certain or speedy by virtue of any of these differences. Especially with regard to the proposed silica regulation, it is known statistically that most pre-silicotics will inevitably deteriorate to being silicotics and that further exposure can only exacerbate this process.[4] The deterioration of pre-asbestosis to asbestosis is less certain, but as noted above, it is reasonable to assume that continued exposure will be harmful.

We do not believe it should properly rest as an individual management decision to determine whether a person with mineral dust effects (MDE) should run the risk of fully contracting a fibrous lung disease. Nor, for that matter, should this be an individual employee decision. Our society has an important stake in protecting its members from preventable disabling or fatal diseases whenever it can, and we see no rationale for

distinguishing for this purpose between, for example, silicosis and lead poisoning.

C. Mineral Dust Effects

Regarding the proposed asbestos regulation, we observe that section 5 permits removal of an employee from further exposure to asbestos by the employer where a physician has stated that his health "has been impaired". We submit that the section should permit such removal when health "has been or may be impaired". We base our concern on the asbestos fibre dust effect (AFDE) which can signal further deterioration to confirmed asbestosis.

The Workmen's Compensation Board has discussed the problem of AFDE in its Directive of May 11th, 1976. It notes that although identification of AFDE is much more problematic than silica dust effects (SDE), and although there is no certainty that removal from exposure will prevent deterioration, "it seems reasonable to assume that the earlier the removal, the less will be the chance of progression".[5] A federal government task force on pneumoconiosis reached much the same conclusion.[6]

With regard to the proposed silica regulation, the employer may remove the employee from exposure where a physician certifies that his health has been or "will be" impaired, thereby clearly recognizing the importance of SDE. Although there are more difficulties in identification and prognosis with AFDE than SDE, we strongly believe that these should not prevent an informed attempt to reduce the incidence of full progression to asbestosis of those workers who can be reasonably believed to be at risk.

II. THE ROLE OF THE INSPECTOR REGARDING RESPIRATORY EQUIPMENT

We support the initiative to require compliance with strict environmental standards without reliance on personal protective equipment. Even more, we commend the draft's criteria for determining

when it is "not feasible" to meet the standards and thereby permit the use of personal protective equipment. We note that the draft does not appear to take into account the cost of meeting the environmental standard, and we believe this to be significant progress.

On the other hand, we also observe that the employer must demonstrate the non-feasibility of compliance to "the satisfaction of an inspector". Without taking a position on the question, we query whether an issue of such importance and complexity can safely be left entirely to the interaction of the employer and the inspector.

Partly because cost is not a factor in determining feasibility, some employers may have a tremendous stake in trying to meet the terms of the non-feasibility criteria, and may put the inspector in an invidious position. The inspector would not by the terms of the section have the benefit of competing submissions or information from the employees or the confidence that his superiors would back up his decision on an appeal. We are not necessarily suggesting a procedure involving a hearing or an appeal, but we do put forward a concern that inspectors may be the subject of substantial persuasion in these situations.

We do suggest that such concern might be handled by requiring that the employer prove his case to the satisfaction of a Director upon notice to the employees. Alternatively, the inspector might have the option of referring decisions on the question to a Director, again on notice to the employees.

IV. THE REGULATION SETTING PROCESS

We are encouraged that the Ministry has taken a more serious approach to the public's participation in the regulation setting process. We note the substantial changes that have taken place

in the draft regulations from those of 1978 to those of 1980 including:

(a) the standards for asbestos and lead;
(b) the involvement of employees in control programs;
(c) the clear obligation not to rely on personal protective equipment;
(d) the availability of health records and monitoring results; and
(e) the refinement of the required health records.

It is evident that the Ministry has taken into account the views of the many observers, including ourselves, who have previously commented on the topics addressed.

We do, however, have one strong objection to the way in which the regulatory process is handled. Maximum benefit from public participation can only be expected to be achieved when all commentators have equal access to ministerial thinking. Lack of a Statement accompanying or preceding the draft Regulations setting out the Ministry's own thinking and supporting material only results in unnecessary speculation, second guessing and possibly misinformed comment.

Whatever one might think of the rationale used by the U.S. National Institute of Occupational Safety and Health (NIOSH) in recommending an asbestos exposure standard of .1 fibres/cc of air, at least the rationale was clear:[7]

(a) no level of asbestos was safe;
(b) no unsafe level should be permitted;
(c) only a detectable limit should be set;
(d) the lowest detectable limit was .1 fibres/cc;
(e) therefore the limit should be .1 fibres/cc.

By achieving this remarkable clarity NIOSH permitted the debate to be waged on the basis of definable issues and calculated positions on some very important non-scientific value judgments. In Ontario, we are not invited to participate in a debate of comparable sophistication and CELA believes we all suffer as a result. The omission to use a Statement is all the more serious since the provincially appointed Advisory Council on Occupational Health and Occupational Safety had already pointed the way towards use of the Statement in developing Regulations.[8]

V. SUMMARY

While welcoming many of the initiatives in the Regulations, particularly the prohibition of reliance on respiratory or other personal protective equipment, our Association does recommend that further attention be given to the following points:

(a) the exposure criteria does not appear to result in the prevention of all but numerically insignificant cases of industrial disease;

(b) the obligation to keep exposure to an arithmetically expressed ceiling could be supplemented by an additional obligation to keep exposure to the lowest level feasible, defining feasibility as a question of available technology;

(c) the obligation to remove employees from actual or potential danger to health as medically certified should not be limited to lead, mercury, isocyanates and vinyl chloride, but should be extended to asbestos and silica;

(d) removal from exposure to asbestos should be extended to cases of medically certified potential danger, as well as actual harm;

(e) the role of the inspector in deciding to permit the use of respiratory equipment needs re-examination;

(f) all regulations must be accompanied by a ministerial Statement as outlined by the Advisory Council on Occupational Health and Occupational Safety.

VI. NOTES

1. The Workmen's Compensation Board actively promotes controlling unnecessary exposure to x-rays in its own diagnostic services. See WCB, 1978 Annual Report, page 14.

2. Advisory Council on Occupational Health and Occupational Safety, First Annual Report, 1 April, 1978 to 31 March, 1979, pages 33-35.

3. WCB, Vocational Rehabilitation Division Manual, Doc. 44-21-01.

4. WCB, Board Policies and Administrative Directives,
   Directive #6, May 27, 1975, page 196
   Directive #2, May 11, 1976, page 197A.

5. Ibid.

6. Health and Welfare Canada, Task Force on Occupational Respiratory Disease (Pneumoconiosis), Ottawa, February, 1979, page 48.

7. U.S. Department of Health Education and Welfare (DHEW), "Remarks by NIOSH Director Anthony Robbins on the Need for a New Asbestos Standard," April 17, 1980 and U.S. DHEW, "Workplace Exposure to Asbestos: Review and Recommendations," April, 1980.

8. Supra, note 2.

76

PLEASE GENTLEMEN - DON'T THROW THE BABY OUT WITH THE BATH WATER!

........................Consider Carefully, The Interests Of Those Who Control The Few Known Asbestos Deposits In This Province - And Set Regulations Within Tolerances That We Can Live With!

There are only two known cement grade Chrisotyle Asbestos mines in Ontario. One is in Matachewan, owned by United Asbestos Inc. the other 50 miles away in Timmins, owned by my family. Our mine was operated in the 1920's, and since then, over One Million dollars has been spent doing drilling and geological work on it.

In a 1976 report on our property, Watts, Griffiths, McOuat Ltd. stated that 'In our opinion, this is Canada's next major mine'. We have 20 million tons of premium, long, cement grade fibre ore in sight, and have every reason to believe that the mine would be 'in ore' to the 1000' depth, which is the maximum for open pit mining. This would give us over 100 million tons of ore, worth, at 1980 prices, in excess of Two Billion dollars.

The tax income to various levels of Government in the mining of these claims, would run into millions of dollars per year - real wealth that would just go to waste if the property were not exploited. Asbestos, being an industrial mineral, the markets would go by default to the mines in our neighbouring province to the east, who have held these markets for years, and intend to keep them.

United Asbestos Inc. has expressed an interest in processing our fibre, which blends with their own to make a top-quality product for export. They have a $60,000,000.00 mill on stand-by, ready to go, which would provide badly needed work for around 300 employees in this less-than-prosperous area.

Their consultants tell them that the plant can operate on 2 fibre per C.C. Indeed in 1977 when the plant was being tuned up, 85% of it was doing just that. This standard is said to be safe for employees, and under known technology, anything below this figure is simply not attainable.

I beg that, in your deliberations, you consider our interests, and those of the Citizens of this Province, who are the real owners of it's minerals.

Respectfully submitted by -

Terry Howes

TERRY HOWES,
37 The Kingsway,
Toronto, Ontario.

Feb. 12th, 1980